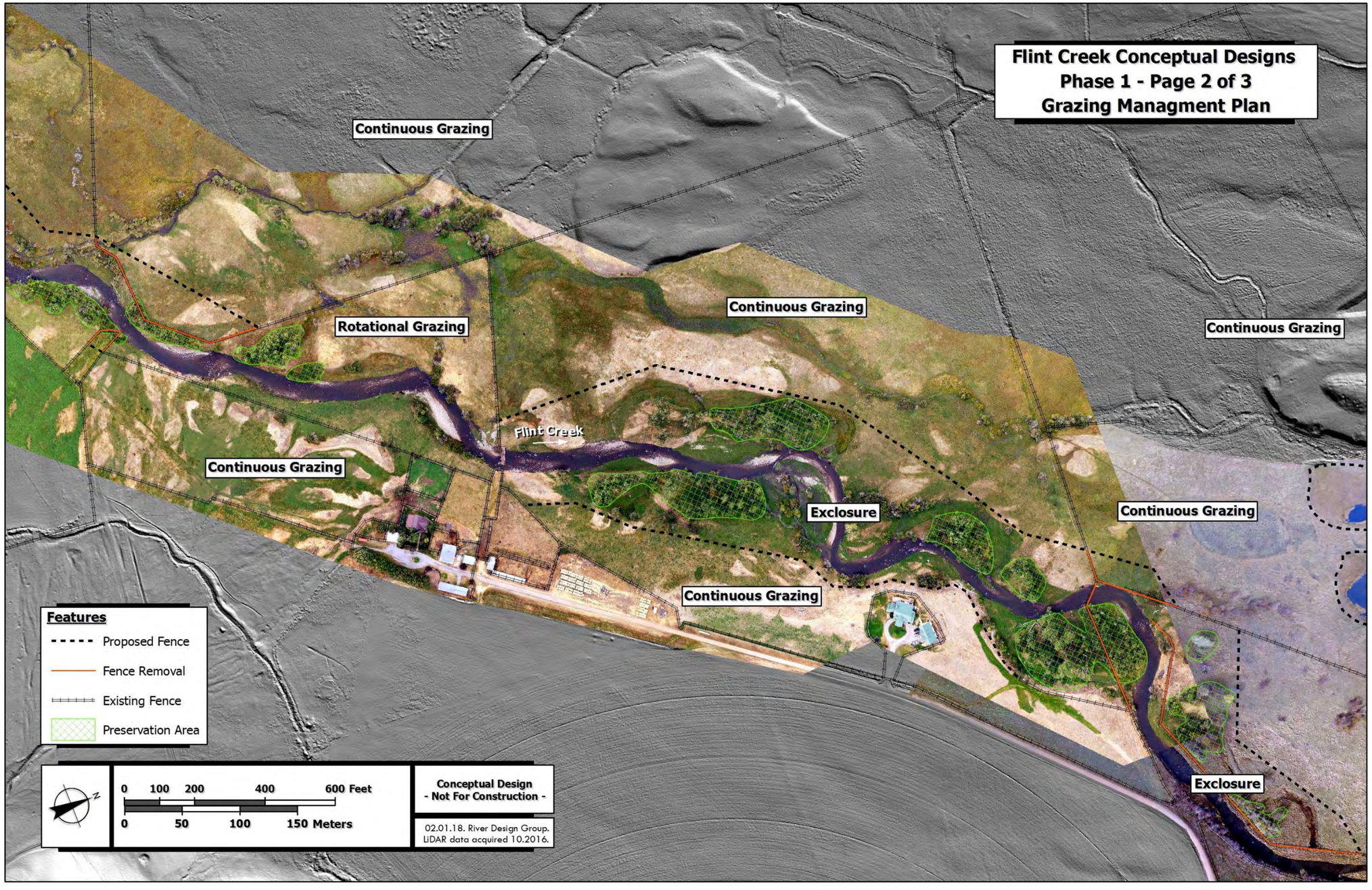


Figure 3. Conceptual grazing management plan for the lower Flint Creek project area.

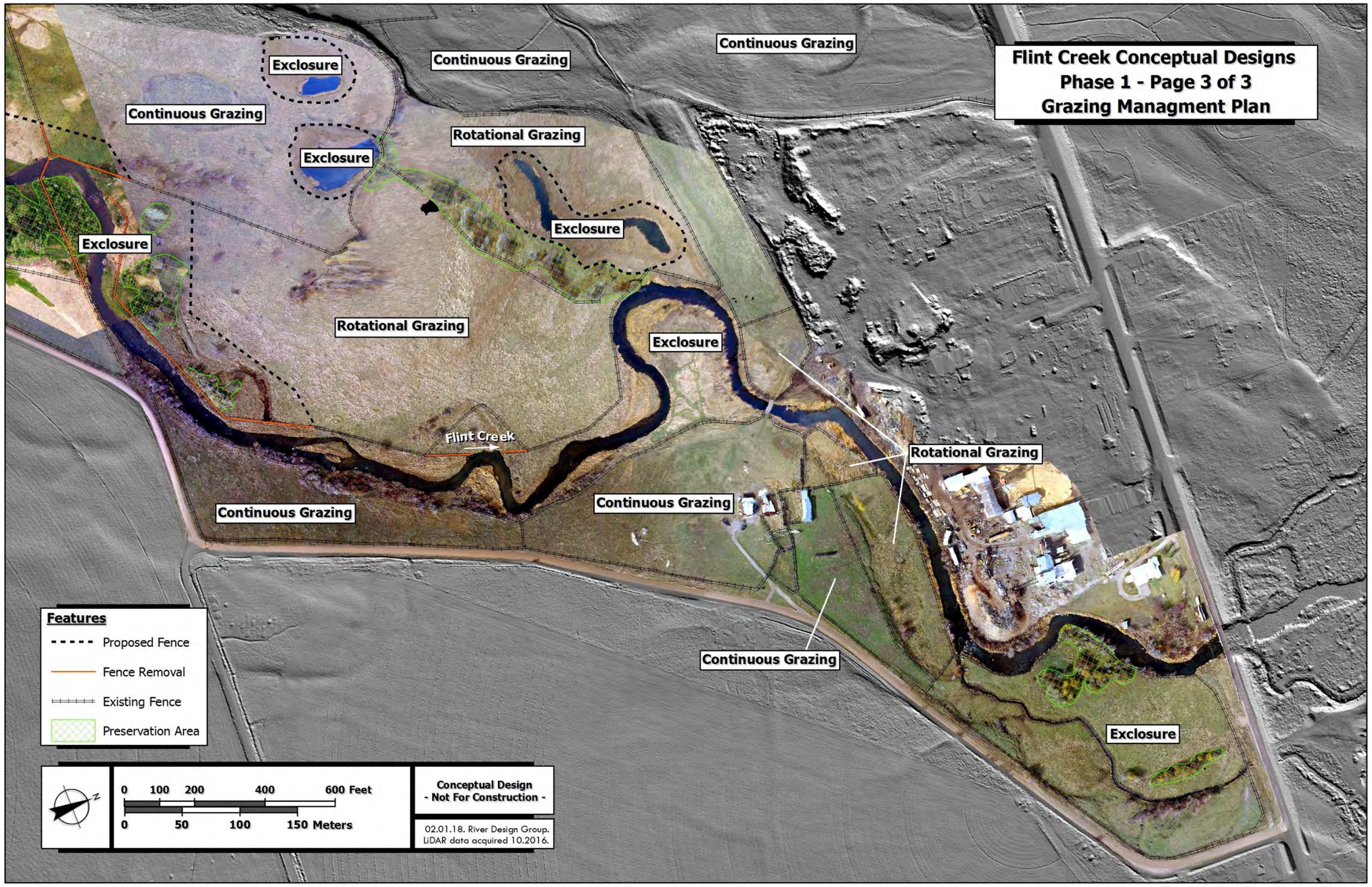


Figure 4. Conceptual grazing management plan for the lower Flint Creek project area.

3.2. Revegetation Plan

The revegetation plan includes recommendations for planting, seeding and browse protection. As a conceptual layout, the revegetation plan is subject to revision based on stakeholder and landowner input. The plan includes approximately 4,500 plants in 78 planting units encompassing approximately 15 acres. Planting units would be enclosed in 8-foot high metal wire or rigid plastic polypropylene mesh fencing to limit browse by wildlife. Planting units would vary in size from 0.004 acres to 0.95 acres and would include approximately 29,400 linear feet of wildlife fence.

The plan addresses establishment of native plant communities in wetland, floodplain, streambank and upland areas. Planting units were placed throughout the area with the goals of increasing connectivity for habitat between existing riparian vegetation communities and increasing the overall quantity and diversity of woody vegetation. Weed mats would be installed at the base of each plant to reduce competition from pasture grasses and weeds. Preservation areas were also identified to highlight where existing vegetation communities are thriving, and the planting units were placed to help increase connectivity between the preservation areas.

The revegetation plan is a passive restoration approach that, if implemented as a stand-alone plan, only partially addresses the range of limiting factors identified. Other limiting factors such as streambank stability and aquatic habitat would need to be addressed with a comprehensive channel restoration plan and grazing management plan as described in the other plans.

The budgetary cost estimate range for the revegetation plan is $270,000 to $459,000. Costs include implementation (materials, equipment and labor), design, oversight, monitoring, maintenance and a contingency. The primary influences on cost are the length of wildlife exclosure fencing and type of fencing material used.

The conceptual revegetation plan is presented in Figures 5 through 7. Plans are presented on three figures from upstream to downstream.

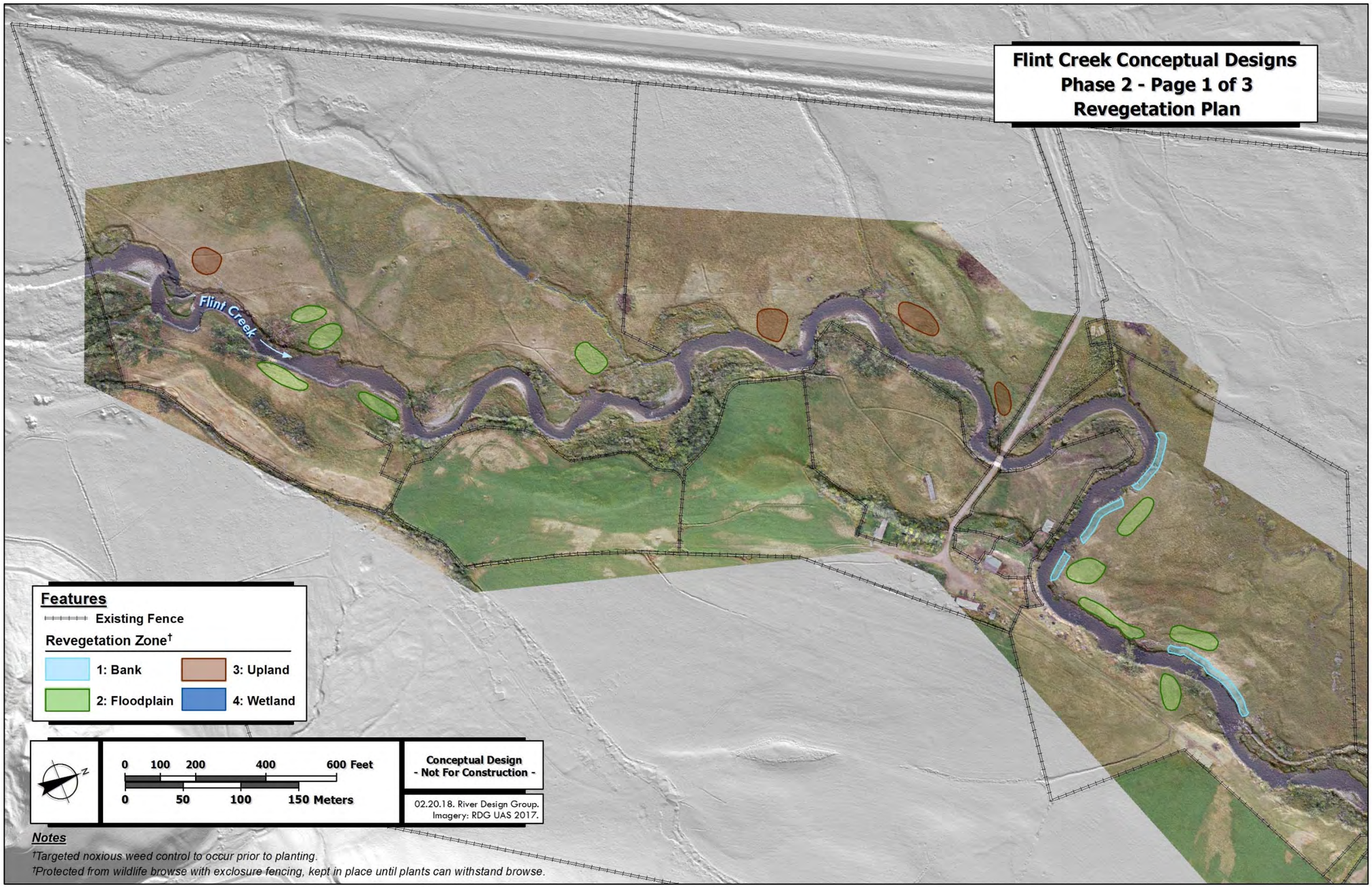


Figure 5. Conceptual revegetation plan for the lower Flint Creek project area.

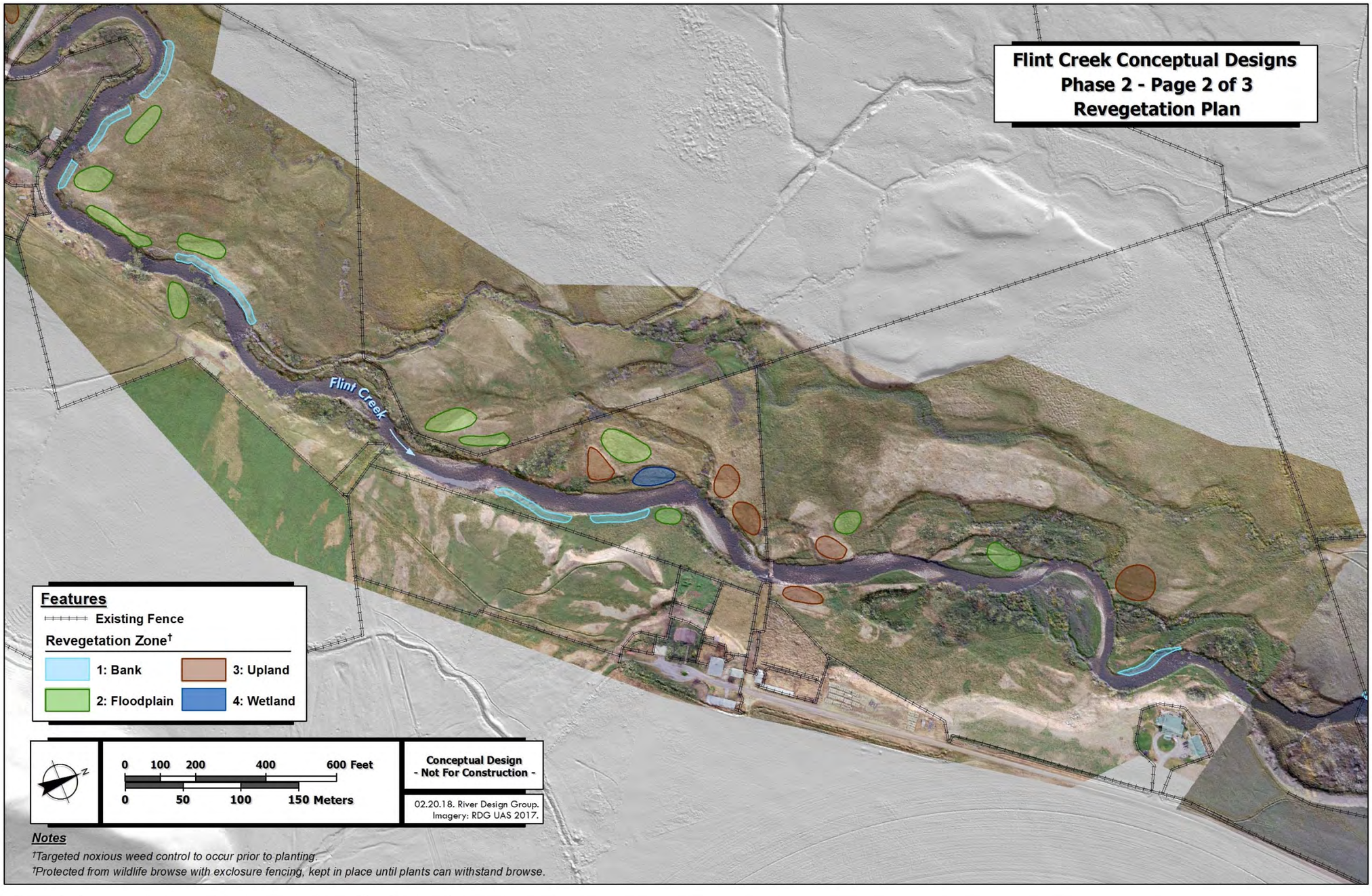


Figure 6. Conceptual revegetation plan for the lower Flint Creek project area.

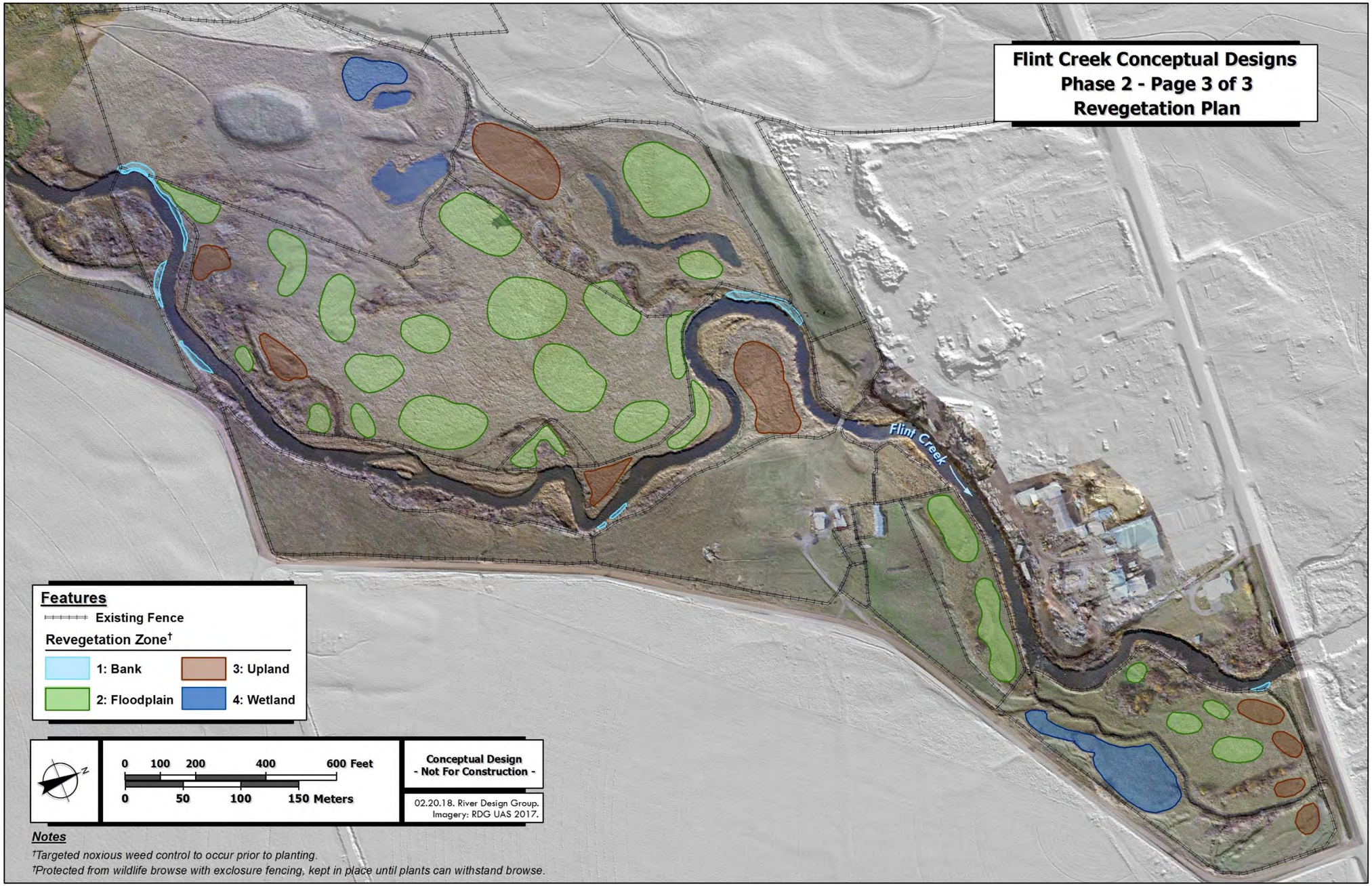


Figure 7. Conceptual revegetation plan for the lower Flint Creek project area.

3.3. Channel Restoration Plan

The channel restoration plan includes recommendations for streambank structures, meander re-activation, spring creek restoration and off-channel habitat enhancement. The channel restoration plan represents a conceptual layout and is subject to revision based on stakeholder and landowner input. The channel restoration plan addresses 10,750 linear feet of eroding streambanks and 1,700 linear feet of spring creek enhancement.

The plan addresses limiting factors related to channel planform, streambank stability and aquatic habitat. Proposed treatment locations are based on impairments observed in the field during the assessment. Streambank structures would be constructed on active channel margins with sparse vegetation and observed bank erosion. Types of streambank structures would be vegetation and wood-based structures including large wood structures and vegetated brush bank structures. Streambanks would be re-graded to gentle slopes, enhanced with floodplain roughness and revegetated with containerized plants. Surplus fill material would be used to fill ditches, narrow the channel and construct points bars.

Meander bends abandoned by channel avulsions or channel straightening would be re-activated to increase channel sinuosity. Irrigation return ditches and springs could be enhanced to improve off-channel habitat availability and provide thermal refugia during temperature extremes.

Spring creek enhancement would include modification of ditches conveying irrigation return flows and spring flow. Spring creek enhancement would include a range of treatments such as channel reconstruction, wetland sod transplant, gravel placement, riffle-pool construction, revegetation and grazing management. Ditches would be filled with material excavated from the new channel or plugged intermittently to create wetland features.

The success of the channel restoration plan is dependent upon implementation of a comprehensive grazing management plan and revegetation plan as described in previous sections. If implemented as a stand-alone plan, the channel restoration plan only partially addresses the range of limiting factors identified, and long-term stability of the treatments could be at risk.

The budgetary cost estimate range for the channel restoration plan is $1,437,000 to $2,415,000. Costs include implementation (materials, equipment and labor), design, permitting, construction oversight, monitoring, maintenance and a contingency. Streambank structures and wood/brush acquisition account for more than half the total cost for the channel restoration Plan.

The conceptual channel restoration plan is presented in Figures 8 through 12. Plans are presented on five figures from upstream to downstream.

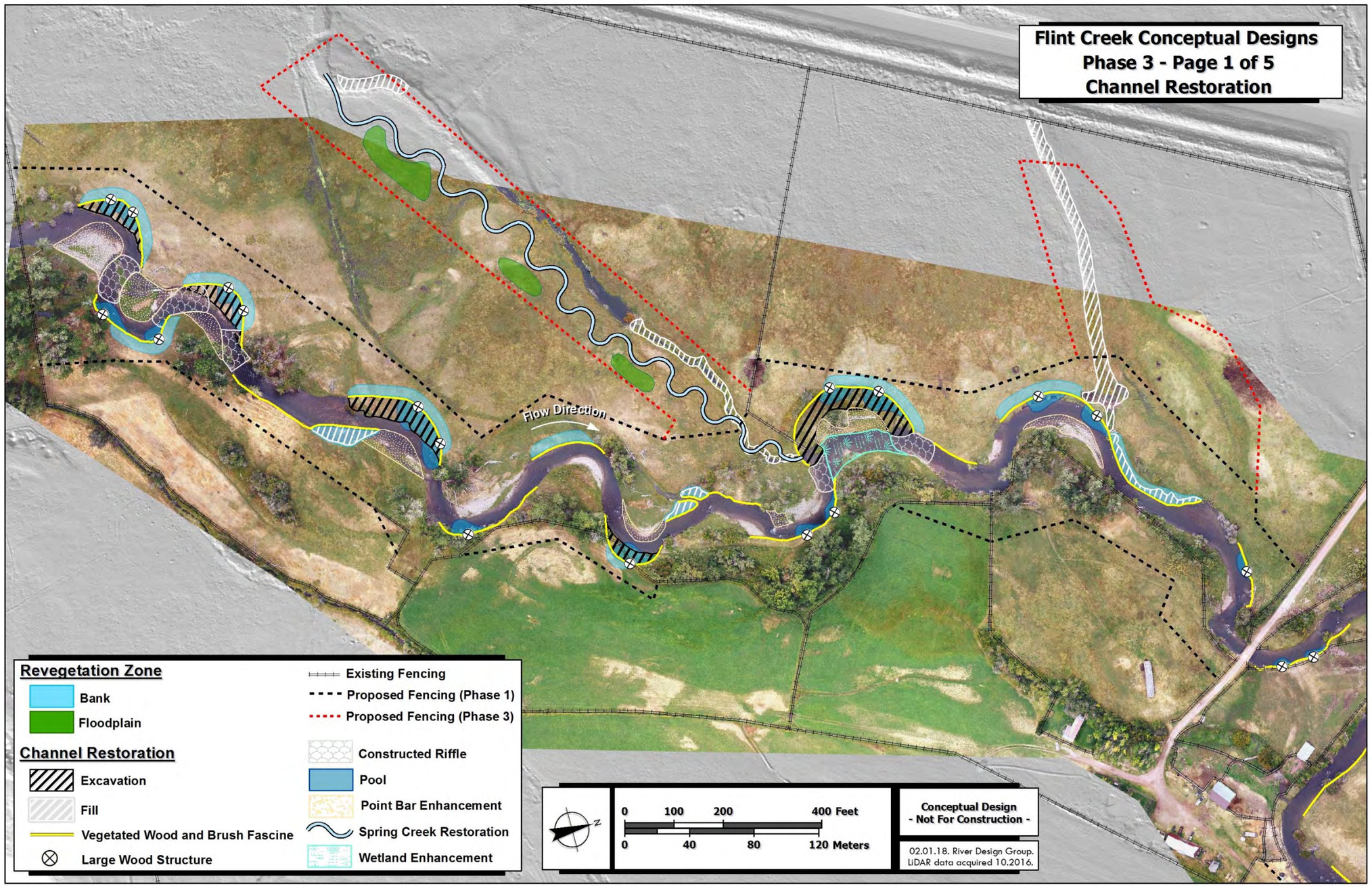


Figure 8. Conceptual channel restoration plan for the lower Flint Creek project area.

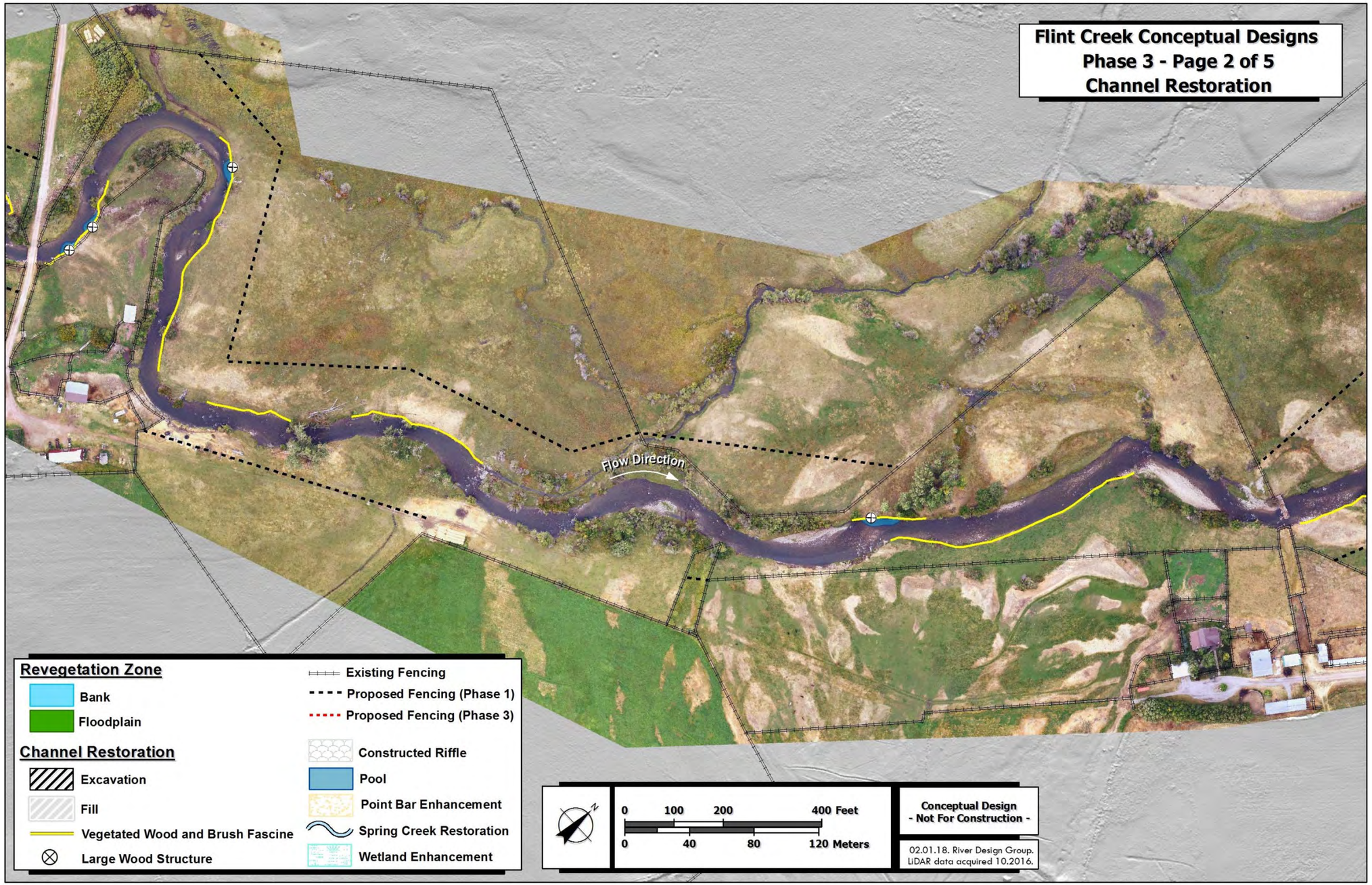


Figure 9. Conceptual channel restoration plan for the lower Flint Creek project area.

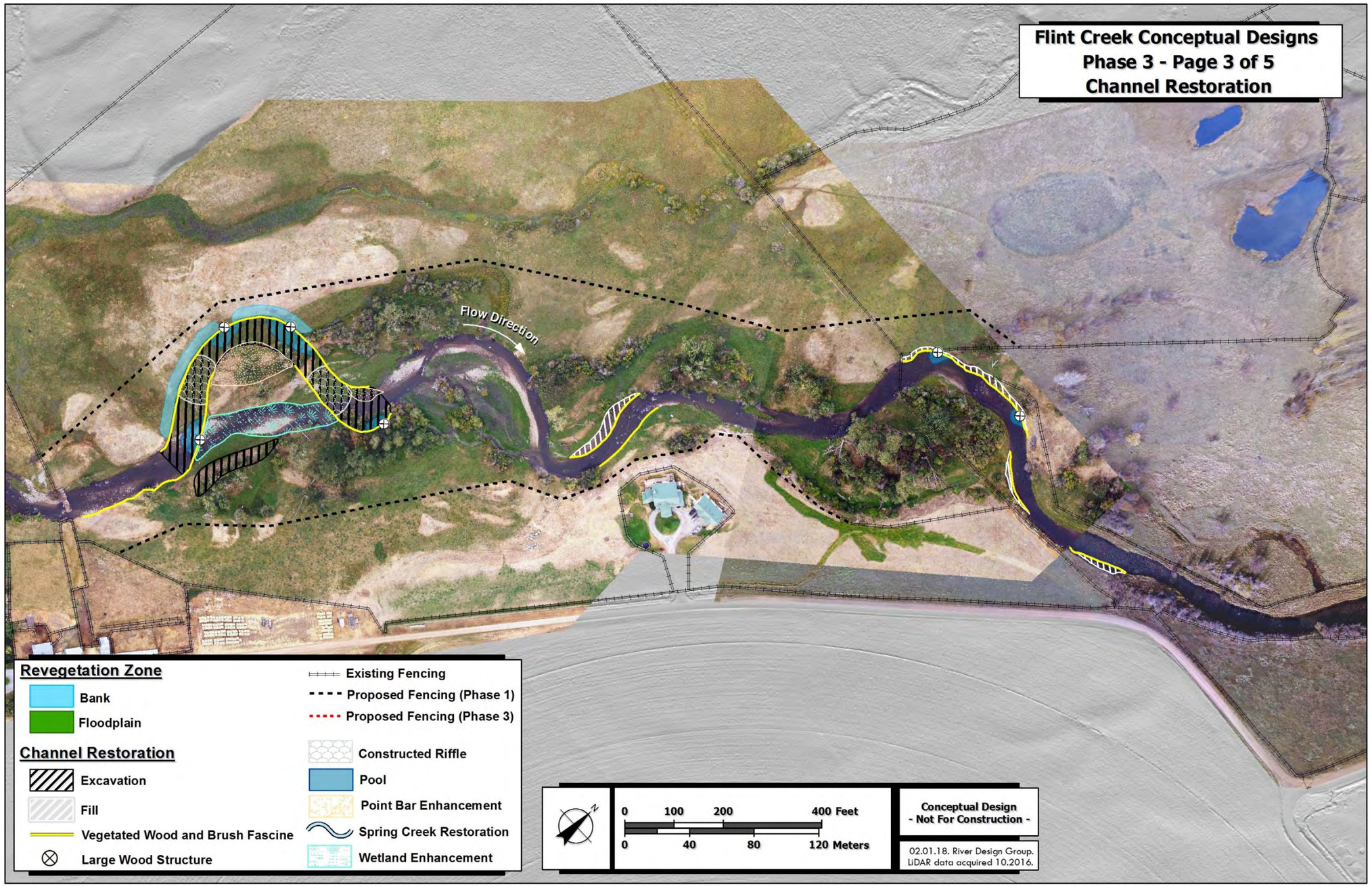


Figure 10. Conceptual channel restoration plan for the lower Flint Creek project area.

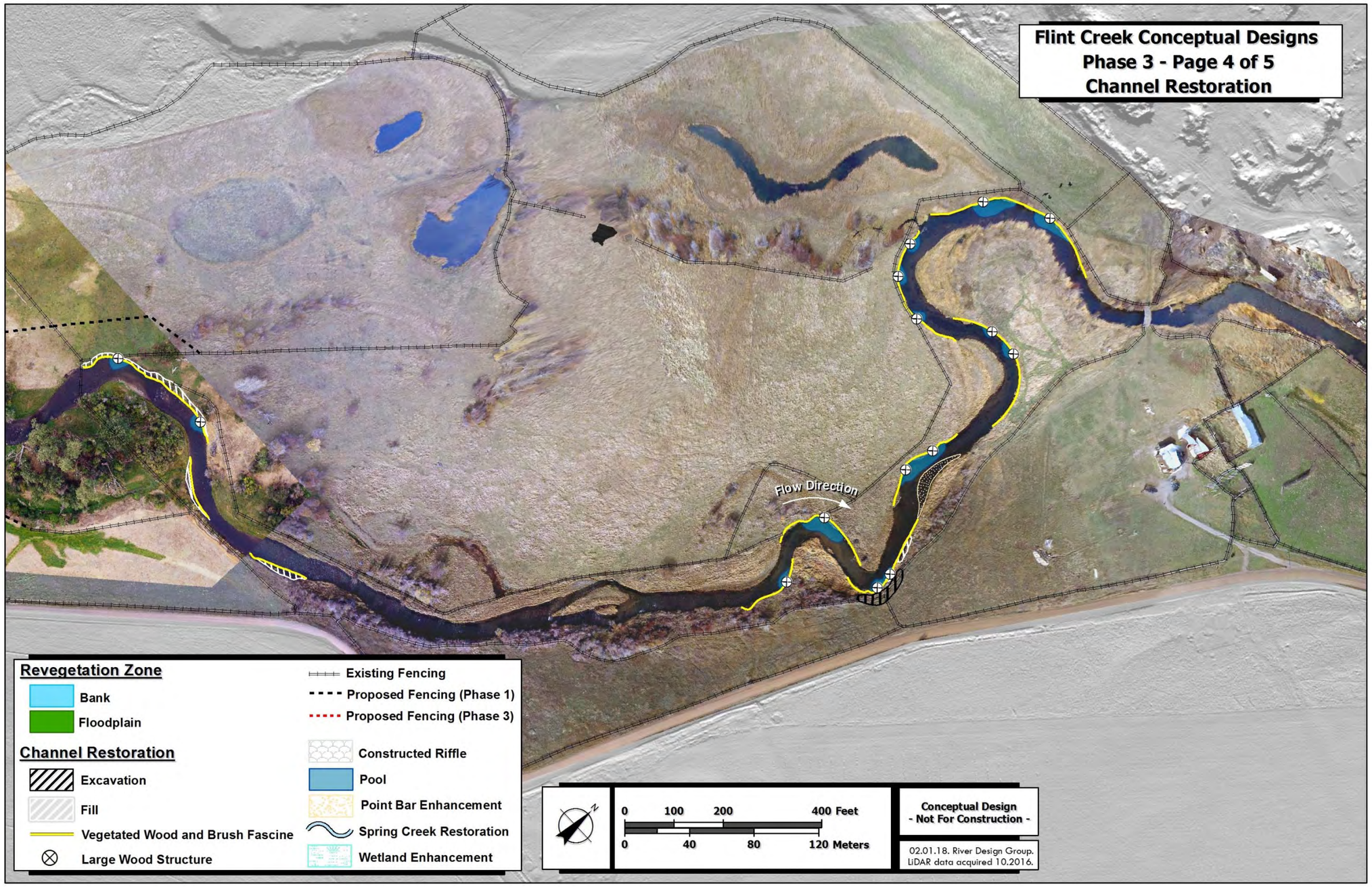


Figure 11. Conceptual channel restoration plan for the lower Flint Creek project area.

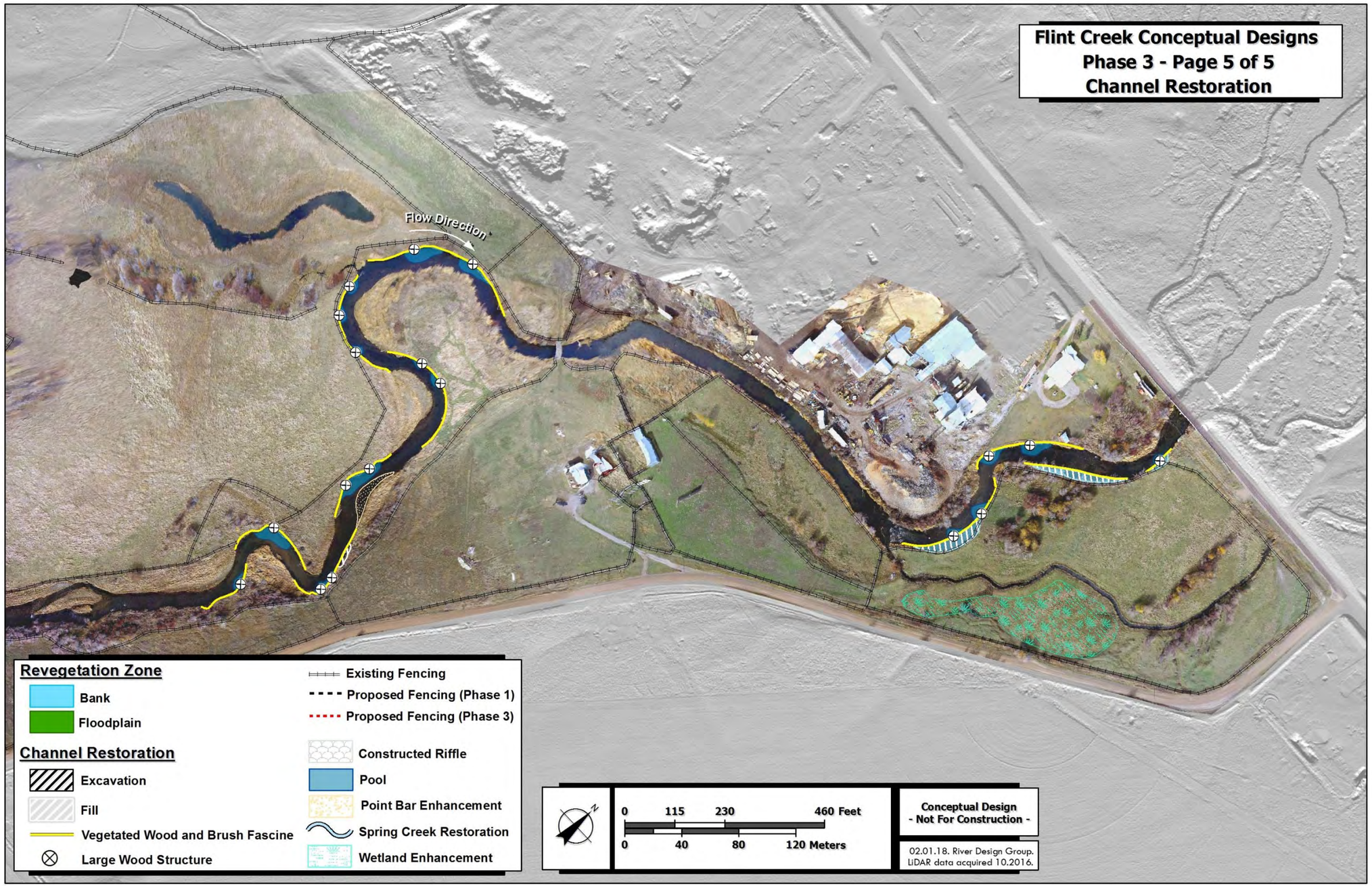


Figure 12. Conceptual channel restoration plan for the lower Flint Creek project area.

3.4. Fish Entrainment Plan

The fish entrainment plan includes recommendations for diversion structure improvements, fish screens and irrigation ditch improvements. The fish entrainment plan represents a conceptual layout and is subject to revision based on stakeholder and landowner input. The fish entrainment plan addresses two unscreened irrigation ditches in the project area.

At the irrigation diversion on the Johnson property, diversion structure and fish passage improvements are not necessary. The existing headgate would be replaced with a new headgate to meet the operational requirements for the fish screen. A sluice gate would be installed alongside the headgate to minimize sediment deposition in the forebay. A fish screen would be installed in the irrigation ditch downstream of the headgate. The type of fish screen would be established during the design process. Streambank and revegetation treatments are recommended on the bank upstream of the ditch intake in order to improve stability.

At the irrigation diversion on the Corbett-Downs property, the existing diversion structure would be removed and replaced with a rock diversion structure consisting of boulders positioned in two u-shaped features pointing upstream. Small pools would be constructed on the downstream bend at the base of the U to provide aquatic organism passage and provide energy dissipation. The diversion structure would divert flow into the ditch and maintain aquatic organism passage in Flint Creek at all flows. Additionally, the existing headgate would be replaced with a new headgate to meet the operational requirements for the fish screen. A sluice gate would be installed alongside the headgate to minimize sediment deposition in the forebay. A fish screen would be installed in the irrigation ditch downstream of the headgate. The type of fish screen would be established during the design process.

The fish entrainment plan could be implemented as a stand-alone plan independent of the other plans. Success of the fish entrainment plan is dependent on inclusion of streambank and revegetation treatments for long-term project stability.

The budgetary cost estimate range for the fish entrainment plan is $192,000 to $245,000. Costs include implementation (materials, equipment and labor), design, permitting, construction oversight, monitoring, maintenance and a contingency.

The conceptual fish entrainment plan is presented in Figures 13 and 14. Plans are presented on two figures from upstream to downstream.

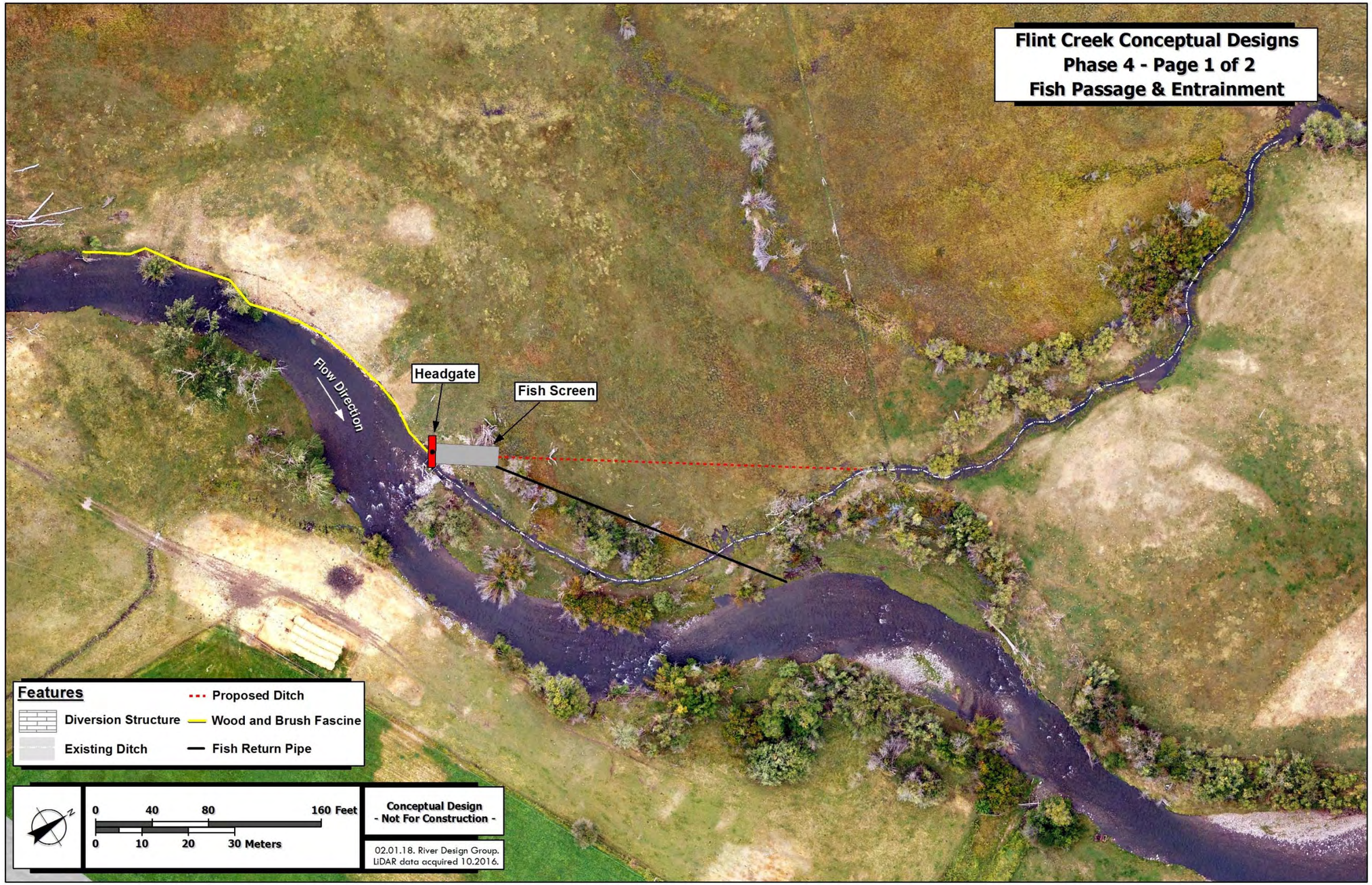


Figure 13. Conceptual fish screen plan for the Johnson property in the lower Flint Creek project area.

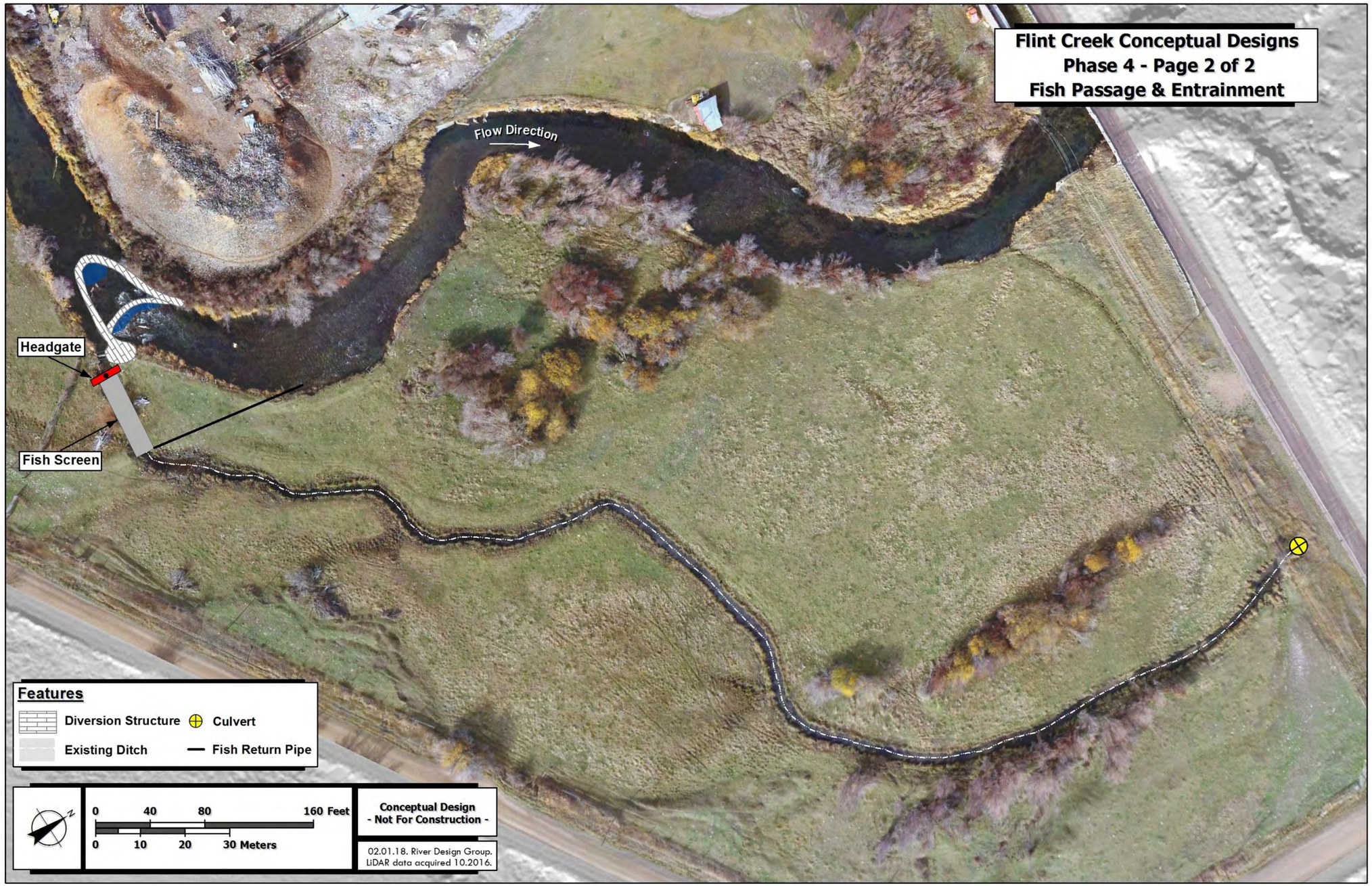


Figure 14. Conceptual fish screen plan for the Corbett-Downs property in the lower Flint Creek project area.

4 Budgetary Cost Estimates

Flint Creek Restoration
Budgetary Cost Estimate
Phase 1 - Grazing Management Plan

	Item	Quantity	Units	Low Unit Cost	High Unit Cost	Low Cost	High Cost
1	Mobilization and Demobilization	1	Lump Sum			$ -	$ -
2	Site Improvements and BMPs	1	Lump Sum			$ -	$ -
3	Boulder Purchase and Delivery	-	Cubic Yards	$ 25	$ 35	$ -	$ -
4	Cobble/Gravel Purchase and Delivery	-	Cubic Yards	$ 25	$ 35	$ -	$ -
5	Brush Acquisition and Delivery	-	Lump Sum	$ -	$ -	$ -	$ -
6	Containerized Plant Purchase and Delivery	-	Plants	$ 6	$ 8	$ -	$ -
7	Earthwork	-	Cubic Yards	$ 5	$ 8	$ -	$ -
8	Streambed and Subgrade Construction	-	Cubic Yards	$ 8	$ 10	$ -	$ -
9	Engineered Log Jam Structures	-	Each	$ 1,500	$ 2,500	$ -	$ -
10	Vegetated Brush Bank Structures	-	Linear Feet	$ 30	$ 50	$ -	$ -
11	Acquire Vegetative Cuttings	-	Cuttings	$ 1	$ 2	$ -	$ -
12	Floodplain Surface Roughness Treatments	-	Acres	$ 1,750	$ 2,500	$ -	$ -
13	Install Containerized Plants and Weed Mats	-	Each	$ 15	$ 20	$ -	$ -
14	Install Individual Browse Protectors	-	Each	$ 30	$ 60	$ -	$ -
15	Fencing and Gates Purchase, Delivery and Installation	15,500	Linear Feet	$ 4	$ 6	$ 62,000	$ 93,000
16	Seeding		Acres	$ 1,000	$ 1,500	$ -	$ -
					SUBTOTAL	**$ 62,000**	**$ 93,000**

	Other Costs			
1	Planning, Design and Permitting	5% of Subtotal	$ 3,100	$ 4,650
2	Construction Oversight (staking, oversight and as-builts)	0% of Subtotal	$ -	$ -
3	Monitoring and Maintenance	0% of Subtotal	$ -	$ -
4	Contingency	5% of Subtotal	$ 3,100	$ 4,650
		GRAND TOTAL	**$ 68,200**	**$ 102,300**

Assumptions for Construction Cost Estimates

1. Costs are based on conceptual restoration designs dated March 2018
2. Unit costs are based on cost data from past restoration project:
3. Mobilization/Demobilization and Site Improvements are assumed to be ~10% of total construction cos
4. Site improvements include access development, staging area development and environmental controls/BMP:
5. Costs are in 2018 US dollars and do include escalation for inflation

Flint Creek Restoration
Budgetary Cost Estimate
Phase 2 - Revegetation Plan

	Item	Quantity	Units	Low Unit Cost	High Unit Cost	Low Cost	High Cost
1	Mobilization and Demobilization	1	Lump Sum			$ -	$ -
2	Site Improvements and BMPs	1	Lump Sum			$ -	$ -
3	Boulder Purchase and Delivery	-	Cubic Yards	$ 25	$ 35	$ -	$ -
4	Cobble/Gravel Purchase and Delivery	-	Cubic Yards	$ 25	$ 35	$ -	$ -
5	Brush Acquisition and Delivery	1	Lump Sum	$ -	$ -	$ -	$ -
6	Containerized Plant Purchase and Delivery (Woody)	4,529	Plants	$ 6	$ 8	$ 27,174	$ 36,232
7	Containerized Plant Purchase and Delivery (Herbaceous)					$ -	$ -
8	Streambed and Subgrade Construction	-	Cubic Yards	$ 8	$ 10	$ -	$ -
9	Engineered Log Jam Structures	-	Each	$ 1,500	$ 2,500	$ -	$ -
10	Vegetated Brush Bank Structures	-	Linear Feet	$ 25	$ 45	$ -	$ -
11	Acquire Vegetative Cuttings	-	Cuttings	$ 1	$ 2	$ -	$ -
12	Floodplain Surface Roughness Treatments	-	Acres	$ 1,750	$ 2,500	$ -	$ -
13	Install Woody Containerized Plants and Weed Mats	4,529	Each	$ 15	$ 20	$ 67,935	$ 90,580
14	Install Herbaceous Plants					$ -	$ -
15	Wildlife Exclusion Fence Purchase, Delivery, Installation	29,400	Linear Feet	$ 4	$ 8	$ 117,600	$ 235,200
16	Fencing and Gates Purchase, Delivery and Installation	-	Linear Feet	$ 4	$ 6	$ -	$ -
17	Seeding	3.0	Acres	$ 1,000	$ 1,500	$ 3,000	$ 4,500
					SUBTOTAL	**$ 215,709**	**$ 366,512**

	Other Costs			
1	Planning, Design and Permitting	5% of Subtotal	$ 10,785	$ 18,326
3	Construction Oversight (staking, oversight and as-builts)	5% of Subtotal	$ 10,785	$ 18,326
3	Monitoring and Maintenance	5% of Subtotal	$ 10,785	$ 18,326
4	Contingency	10% of Subtotal	$ 21,571	$ 36,651
		GRAND TOTAL	**$ 269,636**	**$ 458,140**

Assumptions for Construction Cost Estimates

1. Costs are based on conceptual restoration designs dated March 2018.
2. Unit costs are based on cost data from past restoration projects
3. Mobilization/Demobilization and Site Improvements are assumed to be ~10% of total construction cost
4. Site improvements include access development, staging area development and environmental controls/BMPs
5. Costs are in 2018 US dollars and do include escalation for inflation.

Flint Creek Restoration
Budgetary Cost Estimate
Phase 3 - Streambank and Instream Habitat Plan

	Item	Quantity	Units	Low Unit Cost	High Unit Cost	Low Cost	High Cost
1	Mobilization and Demobilization	1	Lump Sum	$ 30,000	$ 40,000	$ 30,000	$ 40,000
2	Site Improvements and BMPs	1	Lump Sum	$ 30,000	$ 40,000	$ 30,000	$ 40,000
3	Boulder Purchase and Delivery	500	Cubic Yards	$ 25	$ 35	$ 12,500	$ 17,500
4	Cobble/Gravel Purchase and Delivery	500	Cubic Yards	$ 25	$ 35	$ 12,500	$ 17,500
5	Brush Acquisition and Delivery	1	Lump Sum	$ 399,000	$ 654,500	$ 399,000	$ 654,500
6	Containerized Plant Purchase and Delivery	1,368	Plants	$ 6	$ 8	$ 8,208	$ 10,944
7	Herbaceous Plug Purchase and Delivery	3,879	Plants	$ 1	$ 2	$ 3,879	$ 7,758
8	Earthwork	12,000	Cubic Yards	$ 5	$ 8	$ 60,000	$ 96,000
9	Streambed and Subgrade Construction	2,467	Cubic Yards	$ 8	$ 10	$ 19,733	$ 24,667
10	Engineered Log Jam Structures	45	Each	$ 1,500	$ 2,500	$ 67,500	$ 112,500
11	Vegetated Brush Bank Structures	10,750	Linear Feet	$ 25	$ 45	$ 268,750	$ 483,750
12	Acquire Vegetative Cuttings	53,750	Cuttings	$ 1	$ 2	$ 53,750	$ 107,500
13	Floodplain Surface Roughness Treatments	4.5	Acres	$ 1,750	$ 2,500	$ 7,875	$ 11,250
14	Install Containerized Plants and Weed Mats	1,368	Each	$ 15	$ 20	$ 20,520	$ 27,360
15	Install Herbaceous Plugs	3,879	Each	$ 1	$ 2	$ 3,879	$ 7,758
16	Wildlife Exclusion Fence Purchase, Delivery, Installation	14,342	Linear Feet	$ 4	$ 8	$ 57,368	$ 114,736
17	Fencing and Gates Purchase, Delivery and Installation	3,800	Linear Feet	$ 4	$ 6	$ 15,200	$ 22,800
18	Spring Creek Restoration	1,700	Linear Feet	$ 20	$ 35	$ 34,000	$ 59,500
19	Seeding	1.0	Acres	$ 1,000	$ 1,500	$ 1,000	$ 1,500
					SUBTOTAL	**$ 1,105,662**	**$ 1,857,523**

	Other Costs			
1	Planning, Design and Permitting	10% of Subtotal	$ 110,566	$ 185,752
3	Construction Oversight (staking, oversight and as-builts)	5% of Subtotal	$ 55,283	$ 92,876
3	Monitoring and Maintenance	5% of Subtotal	$ 55,283	$ 92,876
4	Contingency	10% of Subtotal	$ 110,566	$ 185,752
		GRAND TOTAL	**$ 1,437,361**	**$ 2,414,779**

Assumptions for Construction Cost Estimates

1. Costs are based on conceptual restoration designs dated March 2018.
2. Unit costs are based on cost data from past restoration projects
3. Mobilization/Demobilization and Site Improvements are assumed to be ~10% of total construction cost
4. Site improvements include access development, staging area development and environmental controls/BMPs
5. Costs are in 2018 US dollars and do include escalation for inflation.

Flint Creek Restoration
Budgetary Cost Estimate
Phase 4 - Fish Entrainment Plan

	Item	Quantity	Units	Low Unit Cost	High Unit Cost	Low Cost	High Cost
1	Mobilization and Demobilization	2	Lump Sum	$ 2,000	$ 3,000	$ 4,000	$ 6,000
2	Site Improvements and BMPs	2	Lump Sum	$ 2,000	$ 3,000	$ 4,000	$ 6,000
3	Demolition and Salvage	2	Lump Sum	$ 500	$ 1,000	$ 1,000	$ 2,000
4	Boulder Purchase and Delivery	115	Cubic Yards	$ 25	$ 35	$ 2,875	$ 4,025
5	Cobble/Gravel Purchase and Delivery	50	Cubic Yards	$ 25	$ 35	$ 1,250	$ 1,750
6	Brush Acquisition and Delivery	1	Lump Sum	$ -	$ -	$ -	$ -
7	Non-woven Geotextile Fabric Purchase and Delivery	1	Roll	$ 375	$ 425	$ 375	$ 425
8	Headgate, Sluice Gate and Piping Purchase and Delivery	2	Lump Sum	$ 9,000	$ 10,000	$ 18,000	$ 20,000
9	Fish Screen Purchase and Delivery	2	Lump Sum	$ 35,000	$ 45,000	$ 70,000	$ 90,000
10	Earthwork	200	Cubic Yards	$ 5	$ 8	$ 1,000	$ 1,600
11	Streambed and Subgrade Construction	-	Cubic Yards	$ 8	$ 10	$ -	$ -
12	Engineered Log Jam Structures	-	Each	$ 1,500	$ 2,500	$ -	$ -
13	Vegetated Brush Bank Structures	-	Linear Feet	$ 25	$ 45	$ -	$ -
14	Acquire Vegetative Cuttings	-	Cuttings	$ 1	$ 2	$ -	$ -
15	Floodplain Surface Roughness Treatments	-	Acres	$ 1,750	$ 2,500	$ -	$ -
16	Install Diversion Structure	24	Hours	$ 225	$ 275	$ 5,400	$ 6,600
17	Install Headgates, Sluice Gates and Piping	32	Hours	$ 225	$ 275	$ 7,200	$ 8,800
18	Install Fish Screens	16	Hours	$ 225	$ 275	$ 3,600	$ 4,400
19	Fencing and Gates Purchase, Delivery and Installation	-	Linear Feet	$ 4	$ 6	$ -	$ -
20	Seeding	1.0	Acres	$ 1,000	$ 1,500	$ 1,000	$ 1,500
					SUBTOTAL	**$ 119,700**	**$ 153,100**

	Other Costs			
1	Planning, Design and Permitting	20% of Subtotal	$ 23,940	$ 30,620
3	Construction Oversight (staking, oversight and as-builts)	15% of Subtotal	$ 17,955	$ 22,965
3	Monitoring and Maintenance	10% of Subtotal	$ 11,970	$ 15,310
4	Contingency	15% of Subtotal	$ 17,955	$ 22,965
		GRAND TOTAL	**$ 191,520**	**$ 244,960**

Assumptions for Construction Cost Estimates

1. Costs are based on conceptual restoration designs dated March 2018
2. Unit costs are based on cost data from past restoration projects
3. Mobilization/Demobilization and Site Improvements are assumed to be ~10% of total construction cos
4. Site Improvements include access development, staging area development and environmental controls/BMP
5. Costs are in 2018 US dollars and do include escalation for inflation
6. Costs include installation of two fish screens.

CORBET - DOWNS PROPERTY
FLINT CREEK - HALL, MONTANA
GRAZING MANAGEMENT RECOMMENDATIONS

Made possible through partnership with:

The Corbett and Downs Families
Trout Unlimited
MT Natural Resource Damage Program
Blackfoot Challenge

December 2017

INTRODUCTION

Grazing Management Recommendations contained in this document are a product of the landowner's desire to develop a sustainable, property-wide plan that balances livestock numbers, available forage, and natural resource values. The property is approximately 160 acres with a variety of land types including about one miles of Flint Creek, sub-irrigated and dryland pastures, and mosaic of riparian and wetland areas.

This document outlines the primary landowner objectives, resource concerns, and provides grazing management recommendations and alternatives. Ultimately, a long-term grazing management plan should be developed that outlines the landowner's selected alternatives with clear implementation guidelines.

LANDOWNER GOALS AND OBJECTIVES

OVERALL PROPERTY GOAL:

Enhance and maintain the overall health and diverse assemblage of habitat types for the benefit of wildlife, environmental services, and aesthetics, while sustainably utilizing and actively managing the natural resources for the benefit of the landowner.

GRAZING GOAL:

Manage livestock in a deliberate, sustainable manner that maintains and enhances the natural resource values of the property.

GRAZING OBJECTIVES:

- Conduct a brief inventory of the property to understand resource conditions, current grazing practices, and infrastructure.
- Develop grazing management recommendations and alternatives based on the landowner's goals and resource concerns identified (this document).
- Landowners and partners review recommendations and select preferred grazing management alternatives.
- Develop a long- term grazing management plan that outlines facilitating practices, grazing rotation, stocking rate, utilization triggers, plant recovery, and wildlife needs.
- Enhance the condition of riparian, wetland, and upland communities through active grazing management.
- Install facilitating practices such as strategic cross-fencing and stockwater improvements to achieve desired grazing and resource results.
- Provide adequate recovery periods for plants and soils after grazing.
- Control noxious weeds through integrated pest management strategies.
- Establish monitoring points to track results of management actions.

BRIEF INVENTORY

(See photographs in the Appendix E)

Water Resources

The property is generally wet with approximately 1-mile of Flint Creek, two springs, and several potholes that support riparian and wetland vegetation communities. The property is not actively irrigated but receives waste water and sub-irrigation from several ditches and springs that flow through the property providing good growing conditions and stockwater.

Pasture Conditions

Grazing utilization was relatively high during both site visits - exceeding 80% in many of the pastures. Pastures condition score sheets were completed for sub-irrigated and dryland pasture groupings. Results indicate that pastures are in fair condition whereby improved management would benefit both productivity and overall health of the property (see Appendix B).

Soils

The soil survey is attached with a list of soil types and associated acres. Fields 1 - 3 appear to have high clay content and retain moisture late in the season. Early and/or continuous grazing has resulted in significant hummocks in portions of the unit (see Appendix C).

Wildlife Habitat

The property likely supports a variety of wildlife species based on the diversity of land types and the large proportion of riparian acres. Red fox, coyote, and Northern Harrier were observed. A diversity of raptors, passerines, and songbirds likely utilize the property in addition to ungulates and fluvial trout population.

Existing Grazing Units

Twelve grazing units were identified however most cross-fences are in poor condition and not functioning (see table and map below). Generally, the fence arrangement is good with like land types delineated (see appendix D for a sketch of existing grazing units). A portion of the fence boundaries remain the same in the final recommendations

Forage Production Estimates

Production was estimated in the field and compared to soil survey estimates under normal precipitation. A detailed inventory was not conducted however the estimates are a good starting point (see forage production calculations in Appendix A).

Existing resources are also well documented in the *Flint Creek Assessment and Conceptual Design (River Design Group, July 2017).*

PRIMARY RESOURCE AND MANAGEMENT CONCERNS

The property has important natural resource values and is in fair condition overall. Evidence of negative resource trends exist on portions of the property that will likely reduce the overall health and resource values over the long-term. The following items were identified during the field inventory (see photographs in Appendix E).

Infrastructure

Most fences and gates are in poor condition and are generally not functioning. As a result, many of the existing units are grazed together (see photos).

Utilization, Duration, and Plant Recovery

Grazing appears to be relatively uncontrolled with multiple fields being grazed simultaneously for extended periods. This allows livestock to selectively graze the same plants and over-utilize portions of the grazing unit. Grazing utilization was relatively high during both site visits (>80%) with an average stubble height of about 3 inches – a clear indicator that grazing periods are too long or stocking rates too high (see photos).

Generally, the grass plant's ability to recover after grazing is significantly reduced when the plant is grazed (or re-grazed) below 4-6". Without adequate leaves to photosynthesize and regrow, plants are forced to use important energy reserves that would otherwise be used for root development and plant maintenance. Managers should be aware that prolonged and/or repeated early season grazing will reduce plant vigor and ultimately lead to a gradual shift in species composition towards a less productive and/or desirable plant community over time. The same holds true for repeated over-grazing.

Grazing Units and Planned Rotation

Most of the existing grazing units are located in logical locations but are not functioning due to poor fence conditions. As a result, the actual grazing units are relatively large. Specific units need to be (re)established in order to manage grazing utilization and timing. No long-term grazing rotation appears to be in place.

Grazing Distribution

Grazing distribution was relatively even, however this is likely a result of extended grazing periods. Fields that contain both wet and dry land types are not grazed evenly as cows generally prefer one forage species over the other at different times of year and stages of growth (see photos).

In-Stream Stockwater

Primary stockwater sources are streams, ditches, and wetlands. No alternative or developed stockwater is available. Portions of Flint Creek and the outlet of the spring-fed pond show clear evidence of hoof sheer and trailing to water (see photos). In-stream stockwater is a good option if livestock pressure is dispersed and/or concentrated in suitable/stable locations (water gaps). However, in-stream stockwater becomes an issue when trails, hoof sheer, and soil compaction reach high enough densities to compromise the function and recovery of the area.

Bank Erosion

Combined with long grazing periods, livestock are creating significant impacts to portions of the riparian areas and wetlands – particularly the south end of Flint Creek, outlet of the pond, and the isolated wetland to the west. Alternatively, the banks of the spring-fed pond and most of its spring creek are in relatively good condition. Clearly, stockwater is the primary reason this resource concern exists (see photos).

Shrub Browsing

There is some evidence of livestock browsing on shrubs, although ungulates likely play a role. Many of the willows and hawthorn have a clear browse line and portions of the understory is disturbed. Furthermore, young plants are limited and a variety of age classes not represented (see photos).

Noxious Weeds

Spotted Knapweed, Hounds Tongue, Canada and Musk Thistle, are present in many of the fields at low-moderate levels. Without control, these infestations will continue to reduce desirable plants and overall forage production (see photos).

GRAZING MANAGEMENT RECOMMENDATIONS

Recommendations to address the existing resource concerns are based on providing adequate recovery periods for both plants and soils. Below, is an outline of the facilitating practices needed to fully support the implementation of a successful grazing plan.

Grazing Prescription

A particular grazing prescription can take a number of forms. This is simply one alternative that can likely achieve the landowner's goals. In general, the most important grazing objective is to control grazing utilization and duration so that resources are able to recover and sustain annual production. The recommended grazing prescription integrates a variety of factors including, landowner goals and grazing unit characteristics. Applied in conjunction, these management actions will likely result in positive vegetation responses and trends over time. Monitoring and evaluation will be important to identify if the overall goals of the property are being achieved and how management can be adjusted to enhance conditions.

Grazing Unit Considerations

Many of the existing grazing units were arranged logically with similar land types delineated and good size. However, given that most cross-fences are in poor condition and will need to be replaced, some of the unit boundaries were adjusted on the map to improve grazing distribution and individual management of land types. Below is a list of considerations for fields or groups of fields with similar characteristics. These considerations ultimately influence the timing of grazing outlined in the rotation.

Wet Soils (Units 1, 2, 3) – These three units appear to have a high clay content that holds moisture. These fields are best grazed in the summer (and beyond) to allow soils to dry out and reduce hummocks.

Wetland and Riparian Areas (Units 5, 6, 7, 8, 13, 14) - These fields have significant natural and irrigation-induced wetlands and riparian areas. They are likely very wet in the spring from flooding, sub-irrigation, active ditches, and springs. Due to the added moisture these wet fields are generally more resilient than the upland units however grazing should be managed to avoid soil erosion, compaction, and trailing. In addition, wildlife nesting and breeding can likely be enhanced in these units through deferred grazing. These units should be grazed in the summer or fall under dry conditions.

Upland Fields (Unit 4, 10, 11, 12) –. Upland units can be grazed earlier in the season however repeated spring grazing should be avoided. Grass in this unit likely becomes decadent late in the season. These units are best grazed in the spring (occasionally), summer, or fall. The RDG Assessment identified these fields for "continuous" grazing however this is not recommended on any units based on plant recovery and soil needs. Soil health is probably the worst in these units. Management actions are needed to build soil organic matter, increase species diversity, and control noxious weeds.

Stream Corridor (Unit 9) – The riparian stream corridor could likely sustain periodic grazing to regenerate grasses and control weeds. Summer or fall grazing is recommended under dry conditions. Monitor shrub utilization and streambank conditions.

Isolated Wetland (Unit 4) – Unit 4 is dry with the exception to an isolated wetland along the northwest boundary. Clearly this is a preferred water source based on the trailing and trampling along the perimeter of the wetland. Although a good rotation would help this area to gradually recover, temporary exclusion of livestock would accelerate the process.

Grazing Rotation

A grazing rotation is important to control the location, duration, and season of use. It also determines how much utilization is to occur and employs "triggers" for rotating the herd to the next field. The grazing rotation recommended here is based on a "Deferred" system, whereby particular fields are not grazed during the growing season to provide adequate recovery periods (and/or allow for wildlife nesting, or particular soils to dry out before grazing). Note that a "Rest-Rotation" grazing system could also achieve overall goals, whereby one or more fields are rested each year (this system could also accommodate potential pasture or wetland renovation plans). The grazing system below is based on cool-season plants that generally begin growth in May, set seed in July, and are relatively dormant through August as seeds disperse. Some vegetative regrowth occurs in September depending on fall precipitation.

Grazing Periods and Schedule

The grazing schedule outlines the timing that each field could be grazed over the next 6-year period - starting on or after June 1. The rotation can repeat but should be reviewed and adjusted as needed to optimize results. Three grazing periods are outlined and represented by the letters "A", "B" and "C". Grazing can occur during or after the specified grazing period. Thus a field marked as "B" can be grazed any time after that period begins (after July 1st). Similarly, a field marked as "C" is available any time after September 1. Early season grazing ("A") has been limited in this example to address plant, soil, and wildlife goals.

A = June 1 – June 30
B = July 1 – July 31
C = September 1 – October 31

Grazing Schedule Example								
Field #	**Field Type**	**Available Days (60 *AU)**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**
4	Dryland pasture	2.6	**B**	**C**	**A**	**B**	**C**	**A**
10	Dryland pasture	1.2	**B**	**C**	**A**	**B**	**C**	**A**
11	Dryland pasture	.1	**B**	**C**	**A**	**B**	**C**	**A**
12	Dryland pasture	.3	**B**	**C**	**A**	**B**	**C**	**A**
1	Wet meadow	13.9	**C**	**B**	**C**	**B**	**C**	**B**
2	Wet meadow	7.4	**C**	**B**	**C**	**B**	**C**	**B**
3	Wet meadow	10.7	**C**	**B**	**C**	**B**	**C**	**B**
5	Wet meadow	4.9	**B**	**C**	**B**	**C**	**B**	**C**
6	Wet meadow	3.3	**B**	**C**	**B**	**C**	**B**	**C**
7	Wet meadow	2.3	**B**	**C**	**B**	**C**	**B**	**C**
8	Wet meadow	4.5	**B**	**C**	**B**	**C**	**B**	**C**
13	Wet meadow	.5	**B**	**C**	**B**	**C**	**B**	**C**
14	Wet meadow	2.7	**B**	**C**	**B**	**C**	**B**	**C**
9	Stream corridor	4.1	**Rest**	**Rest**	**Rest**	**Rest**	**B**	**Rest**
		58						

*1.0 Animal Unit (AU) is equivalent to a 1000lb cow or pair. Thus, a 1200lb animal is equivalent to 1.2 Animal Units (50 head/pair = 60 Animal Units).

A = June 1 – June 30
B = July 1 – July 31
C = September 1 – October 31


Hall, MT
1
34 ac
2
18 ac
3
26 ac
4
19 ac
5
12 ac
6
8 ac
7
5.5 ac
8
11 ac
9
15 ac
10
7.5 ac
11
0.2 ac
12
2 ac
13
2 ac
14
8 ac
Flint Creek
Property Boundary
Perm Electric Crossfence
Temp Electric Crossfence
Stock Water
N
0 250 500 1,000 1,500
Feet

Forage Production Estimates

Production was visually estimated in the field and compared to soil survey estimates under normal precipitation. Given that forage production can fluctuate significantly from year to year, estimates are only guidelines and should not be taken too literal. *Rather, the condition of the field and grazing "triggers" should dictate how many days livestock are in each grazing unit.* (Forage production calculations are provided in Appendix A).

Grazing Triggers - Resource Condition Standards

The following grazing "triggers" (resource condition standards) identify the acceptable levels of impacts that can occur while ensuring that resource conditions are maintained and enhanced. Livestock should be removed from the field (or excluded from the area) once any of the triggers are reached (or utilize temporary electric fence to exclude livestock from affected areas).

- Grass Utilization – Approximately 50% utilization for upland grasses. Greater than 4 inch stubble height for pastures.
- Streambank, Wetland and Riparian Soils - Less than 10% of streambank, wetland, and riparian soils disturbed by hoof sheer. Managers should monitor conditions closely while grazing occurs.
- Shrub and Tree Regeneration/Utilization – Less than 20% of the current year's growth utilized. Less than 10 percent of juveniles killed or damaged. Strive for all age classes present, particularly in riparian areas.
- Weed Management – Less than 5% presence of noxious weeds. Eradicate all Category 3 weed species and actively control Category 1 and 2 weeds.

Cross-Fencing

The use of cross-fencing to reduce overall field sizes will accomplish several objectives including:

- Reduce grazing days in each sub-field
- Increase recovery time for plant and streambanks
- Reduce riparian and wetland impacts, and
- Improve grazing distribution

Because, cross-fencing of larger fields will reduce the grazing days in each sub-unit, livestock are unable to graze the same plant multiple times or its regrowth which ultimately reduce plant vigor and overall trend of the plant community. Ideally, fields will be a sized to accommodate a particular herd for up to 14 days. A herd size of 50 head (60 Animal Units) was used for the purposes of this document. Small fields could be combined and/or large fields split to achieve reasonable duration in each field.

A variety of cross-fence types are available and can achieve the same goal. However, based on successful examples elsewhere, it is recommended to use single-strand electric fence for interior units. The fences can be permanent, drop-down, or temporary. An advantage to this fence type is that it is effective, less expensive, requires less maintenance, and can following rounded edges of fields rather than straight lines needed for barb-wire. Furthermore, additional cross-fence spurs can be extended from electrified sections to exclude particular areas or create new grazing sub-units.

Stockwater Development

Adequate water is essential for each field. Multiple and dispersed stockwater sources will:

- Improve grazing distribution
- Provide plants adequate recovery periods
- Reduce concentrated riparian impacts
- Provide more management flexibility in the grazing rotation.

Many of the fields have ditches, springs, pothole wetlands, or stream that provide stockwater. Stockwater can be developed in several ways including hardened water gaps, surface water or piping water (from a source to tank) with electric, gravity, or solar power. Although water piped to stocktanks is the most ideal method to shift grazing pressure, it can be difficult to justify the expense on a property with so much available surface water. Below is an outline of stockwater in each field with alternatives.

Unit	Water Source(s) andLlocations	Recommended Action
1	Irrigation ditch - SW	Same
2	Irrigation ditch?	Explore options
3	Irrigation ditch – NW	Same
4	Water gap at side channel – SE	Same
5	Spring fed pond – NW Water gap - SE	Existing gap in poor location. Develop hardened water gap/crossing at pond outlet and at stream riffle – S
6	Spring Creek and wetland	Same
7	Water gap -	Existing gap in poor location. Consider hardened water gap at riffle – S
8	Spring Creek access - NW	Same Consider hardened water gap at side creek channel - SE
9	Flint Creek	Flint Creek
10	Old water system (functioning?) - N	Repair water system near bridge
11	Not identified	Repair water system near bridge, pipe to nearby units. Or consolidate/rearrange units around tank.
12	Not identified	Repair water system near bridge, pipe to nearby units.
13	Spring Creek	Same. Consider gap and fencing to control access.
14	Ditch	Same

Mineral/Protein Supplements

Utilize supplement to improve nutrition and grazing distribution. Place tubs away from water sources (>1/4 Mile) to encourage grazing utilization in the uplands and reduce presence in riparian areas. Tub locations should be moved each year to eliminate permanent attractions and disturbed sites.

Weed Control

Develop and implement an integrated weed management strategy to reduce competition and enhance the vigor of desirable plants. Strongly consider herbicide treatments to control weed infestations. Biological controls are not necessarily recommended given that the property is relatively small, very accessible, and weed infestations are still manageable with herbicide.

ADDITIONAL MANAGEMENT CONSIDERATIONS

Contingency Plan

Unforeseen events such as drought, wildfire, or lack of water may require immediate grazing management actions to mitigate resource impacts. Actions may include adjustments to the grazing rotation or stocking rates, temporary grazing exclusions, additional feeding, access to new water/grazing sources, etc.

Maintenance and Labor

Grazing plans can require a significant increase in management and labor, particularly monitoring conditions, maintaining fences, and following a rotation as best possible. Infrastructure improvements such as fences and water systems will require maintenance as needed.

Record Keeping

Maintain records of the actual grazing rotation - regardless of what happens - to track management actions in each field. Maintain records of all other management actions that influence the grazing rotation and resources including weed spraying, seeding, weather, stocking adjustments, etc.

Monitoring and Evaluation

Two types of monitoring exist; 1) Short term monitoring of the fields during grazing, including grazing utilization, stream banks, and other resource conditions that trigger the rotation to the next field. 2) The second type of monitoring is long-term, which assesses resource conditions and the results of management actions taken. Long-term monitoring is useful to identify trends over time. They can measure forage production, species composition, percent of bare ground, weed infestations, grazing distribution, etc. This can be as simple as photo-points in each grazing unit, to a more detailed approach such as vegetation transects. Without monitoring, it can be difficult to determine if management actions are working or not - and how to adjust management actions for better results. Consider requesting assistance from a local extension worker to develop a monitoring plan.

Adaptive Management

Adaptive management will be important to refine a plan over time. Assess the results of management actions taken and review progress annually. Adjust management actions accordingly to achieve higher resource condition standards.

NEXT STEPS

- Confer with current and past grazing lessees to utilize local knowledge and identify specific grazing contstraints or challenges faced on the property.
- Select preferred alternatives that meet overall goals.
- Develop a specific long-term grazing plan that outlines desired conditions and facilitating practices.
- Implement plan
- Monitor plan and results in the field
- Adjust plan as needed

ATTACHMENTS:

A. Forage Production and Stocking Rate Estimates
B. Pasture Condition Score Sheets
C. Soil Survey
D. Sketch Map of Existing Grazing Units
E. Photographs

Corbett-Downs Property 11/1/17
Forage Production and Stocking Estimates

A	B	C	D	E	F	G	H	I	J	K				
Field #	Field Name	AC	Land Type	Lbs/Ac	Harv. Eff.	Avail. Forage/ Ac	Avail. AUM/Ac	Ac/ AUM	Acres/ Land Type	AUM/ SubUnit	Available days with 48 AU (40 head)	Available days with 60 AU (50 head)	Available days with 72 AU (60 head)	Timing
						E x F	(G/915)	J/K		H x J	K/48*30	K/60*30	K/72*30	
1		34	Wet meadow	3000	0.25	750	0.82	1.2	34	27.9	17.4	13.9	11.6	> July 1
2		18	Wet meadow	3000	0.25	750	0.82	1.2	18	14.8	9.2	7.4	6.1	> July 1
3		26	Wet meadow	3000	0.25	750	0.82	1.2	26	21.3	13.3	10.7	8.9	> July 1
4		16	Upland	1200	0.25	300	0.33	3.1	16	5.2	3.3	2.6	2.2	> June 1
4b		3	Wetland exclusion	0					3		0.0	0.0	0.0	
5		12	Flood plain/wet meadow	3000	0.25	750	0.82	1.2	12	9.8	6.1	4.9	4.1	> July 1
6		8	Flood plain/wet meadow	3000	0.25	750	0.82	1.2	8	6.6	4.1	3.3	2.7	> July 1
7		5.5	Flood plain/wet meadow	3000	0.25	750	0.82	1.2	5.5	4.5	2.8	2.3	1.9	> July 1
8		11	Flood plain/wet meadow	3000	0.25	750	0.82	1.2	11	9.0	5.6	4.5	3.8	> July 1
9		10	Riparian corridor	3000	0.25	750	0.82	1.2	10	8.2	5.1	4.1	3.4	> July 1
9b		5	Water	0					5		0.0	0.0	0.0	
10		7.5	Upland	1200	0.25	300	0.33	3.1	7.5	2.5	1.5	1.2	1.0	> June 1
11		0.2	Upland	1200	0.25	300	0.33	3.1	0.2	0.1	0.0	0.0	0.0	> June 1
12		2	Upland	1200	0.25	300	0.33	3.1	2	0.7	0.4	0.3	0.3	> June 1
13		2	Flood plain/wet meadow	2000	0.25	500	0.55	1.8	2	1.1	0.7	0.5	0.5	> July 1
14		8	Flood plain/wet meadow	2500	0.25	625	0.68	1.5	8	5.5	3.4	2.7	2.3	> July 1
HQ		2	HQ						2					
Total		170.2							170.2	117	73.1	58.5	48.8	

Appendix B

Flint Creek riparian restoration 014-2020

Pasture Condition Score sheet - Standard for IRRIGATED PASTURE — MT-ECS-116A

Cooperator	Flint Creek			Date	10-10-17
Conservationist	BW			Pasture number(s)	4, 10, 11, 12 (Dry land)
Forage Suitability Group(s)	Wheatgrass, G. Wild Rye, S. brome, quackgrass				
Current Years Precipitation (check one)	Above Normal ☑	Normal ☒	Below Normal ☒		

Evaluate the site and rate each indicator based upon your observations. Scores for each indicator may range from 1 to 5. Multiply the points x the weight to get weighted points. Sum the weighted points to determine

Indicator/Weight	1 Points	2 Point	3 Points	4 Point	5 Points		Wt.	Wtd. Pts.
Percent Desirable Plants / 10%	Desirable forage species represent <30% of stand (total ADW). Annual weeds, other undesirable herbaceous plants, and/or woody species, dominate pasture.	Desirable forage species represent 30 to 50% of stand (total ADW). Broadleaf weeds and other undesirable herbaceous species are prevalent and expanding. Woody species often present.	Desirable forage species represent 51 to 75% of stand (total ADW). Undesirable broadleaf weeds and annual grasses present and expanding. Some woody species may be present.	Desirable forage species represent 76 to 90% of stand (total ADW). Remainder of the stand is composed primarily of perennial forage species with intermediate grazing value. Few undesirable broadleaf weeds or annual grasses present. No woody species	Desirable forage species exceed 90% of pasture stand (total air-dry weight ADW). Remainder of the stand is comprised of perennial forage species having intermediate grazing value.	3	1.0	3
Live Plant Cover (Live stems and green leaf cover of all species at adjusted 3" height.) / **15%**	FOLIAR COVER: <50% BASAL COVER: <15% Photosynthetic area very low. Very little plant cover to slow or stop runoff.	FOLIAR COVER: 51 to 70% BASAL COVER: 15 TO 25% Photosynthetic area low. Low retardation to runoff by pasture vegetation.	FOLIAR COVER: 71 to 90% BASAL COVER: 25 TO 35% Most forage plants grazed close; little leaf area to intercept sunlight. Moderate retardation to runoff by pasture vegetation.	FOLIAR COVER: 91 to 95% BASAL COVER: 35 TO 50% Pasture not uniformly grazed and there is some loss of potential for photosynthetic activity. pasture vegetation offers high retardation to runoff.	FOLIAR COVER: 96 to >100% BASAL COVER: >50% Forages maintained in leafy condition for best photosynthetic activity. Very dense stand with either no runoff, or very slow runoff flows.	3	1.5	4.5
Plant Diversity (Evaluate as a complete system. Functional groups of forages are plant groupings that have similar growth habits and management needs). / **10%**	One dominant perennial forage species (>75% of stand for total ADW). or, More than 5 forage species (each <20% of stand) all of one functional group. Uneven grazing use. Grazing use poorly distributed.	Two to five forage species all of one functional group (>75% of stand for total ADW). At least one perennial forage species avoided by livestock resulting in presence of mature seed stalks and uneven grazing use. Forage species occur in patches, and are not intermixed.	Two to three forage species all of one functional group (each at least 20% of stand for total ADW). Forage species intermixed, have compatible growth habits, similar re-growth periods, and have comparable palatability. No forage plants ungrazed.	Two to four forage species representing two functional groups (each at least 20% of stand for total ADW) – at least one perennial grass and one perennial legume species are present. Forage species well intermixed, have compatible growth habits, similar re-growth periods, and comparable palatability. No forage plants ungrazed	Three to five forage species representing at least three functional groups (each ±20% of stand for total ADW) – at least one grass and one legume species are present. Forage species well intermixed, have compatible growth habits, similar re-growth periods, and have comparable palatability. No forage plants ungrazed.	3	1.0	3
Plant residue (organic material covering soil between tillers or stems) / **3%**	Ground Cover: No identifiable residue present on soil surface. Thatch, if present, is heavy (>1-inch thick). STANDING-DEAD FORAGE: More than 25% of total pasture production (air-dry weight).	Ground Cover: <10% of soil surface with dead forage plant residue present. Thatch, if present, 0.5" to 1" thick. STANDING-DEAD FORAGE: 5 to 25% of total pasture production (air-dry weight).	Ground Cover: 10 to 20% of soil surface with dead forage plant residue present. Thatch buildup, if present, less than 0.50" thick. STANDING-DEAD FORAGE: 5 to 15% of total pasture production (air-dry weight).	Ground Cover: 20 to 30% of soil surface with dead forage plant residue present. No thatch buildup. STANDING-DEAD FORAGE: Less than 5% of total pasture production (air-dry weight).	Ground Cover: 30 to 70% of soil surface covered with dead forage plant residue. No thatch buildup. STANDING-DEAD FORAGE: No standing dead forage plant material available to grazing animals.	3	0.3	.9
Plant Vigor / 20%	No recovery after grazing; or leaves pale yellow to brown; or plants at permanent wilting point; or most all plants evidence stress due to insects and/or disease. Exercise paddock only. Or, lodged, dark green, overly lush, forage that is generally avoided.	Recovery after grazing takes 2 or more weeks longer than normal; or yellowish-green leaves; or major insect or disease loss; or plants wilted most of day. Productivity 50 to <70% of the high production potential for the site.	Recovery after grazing takes 1 week longer than normal; or urine or dung patches dark green in contrast to rest of plants; or minor insect or disease loss; or plants wilted only during mid-day. Pasture productivity 70 to 85% of the high production potential listed for the site.	Recovery after grazing takes 1 or 2 days longer than normal; or light-green leaves of most plants as contrasted to greener plants in urine and dung patches; or minor insect or disease damage. No plant wilting. Productivity of stand near the high production potential listed for the site.	Rapid recovery following grazing. Healthy green color of foliage. No sign of insect or disease damage. No leaf wilting. Yields at listed high production potential for species adapted to the site.	2	2.0	4

Flint Creek riparian restoration 014-2020

Evaluate the site and rate each indicator based upon your observations. Scores for each indicator may range from 1 to 5. Multiply the points x the weight to get weighted points. Sum the weighted points to determine								
Indicator/Weight	**1 Points**	**2 Point**	**3 Points**	**4 Point**	**5 Points**		**Wt.**	**Wtd. Pts.**
Percent legume (Cool season stands) / **5%**	No legume in pasture; or, more than 60% (total ADW) of bloat-causing legumes.	Non-spreading forage legumes less than 15% (ADW); or, 45% to 60% (total ADW) of spreading legume with grass composition declining.	Non-spreading forage legumes represent 15% to <25% (total ADW) of pasture production. Spreading legumes may be increasing.	Non-spreading forage legumes represent 25% to <35% (total ADW) of pasture production.	Non-spreading forage legumes represent 35% to 45% (total ADW) of pasture production. No forage grass loss; forage grasses may be increasing. Non-spreading legumes would include alfalfa, birdsfoot trefoil, sainfoin, cicer milkvetch. Spreading legumes would include clovers and black medic.	1	0.5	.5
Uniformity of Use / 7%	Little-grazed patches cover over 50% of pasture. Mosaic pattern of grazing use; or there are identifiable areas within pasture being avoided.	Little-grazed patches cover over 25 to 50% of pasture either in a mosaic pattern or as identifiable areas within the pasture that are not frequented.	Little-grazed patches cover 10 to 25% of pasture either in a mosaic pattern or as identifiable areas within pasture that are not frequented.	Little-grazed patches represent minor spots where one to several forage plants are not grazed. Urine and dung patches are avoided.	Ungrazed areas only at urine or dung patches. No ungrazed forage species.	3	0.7	2.8
Livestock Concentration Areas / 10%	Livestock concentration areas and trails cover >10% of the pasture; or all concentration areas allow for contaminated runoff to be conveyed directly into adjacent water bodies.	Livestock concentration areas and trails cover 5 to 10% of the pasture; most concentration areas are close to water channels allowing contaminated (unbuffered) runoff to drain into adjacent water bodies.	Isolated livestock concentration areas and trailing evident (<5% of pasture); no more than one concentration area that drains (unbuffered) directly into adjacent water body.	Some livestock trailing evident with one or two, small, concentration areas. There is a buffer zone between any concentration area and adjacent water bodies.	Absence of livestock concentration areas and trailing; Or, heavy use areas located or treated to minimize contaminated runoff.	2	1.0	2
Soil Compaction (Probe moist soil comparing the treatment unit to an ungrazed area; i.e. fence row.) / **5%**	Infiltration capacity and surface runoff severely affected by compaction. Livestock traffic is eradicating pasture plants over large areas. Very hard to push a probe into soil without damage to probe.	Infiltration capacity reduced due to large areas of bare ground and dense compaction layer at surface. Livestock trails common. Off-trail hoof prints common. Hard to push a probe through soil layers.	Infiltration capacity lowered and surface runoff increased due to plant cover loss and soil compaction by livestock traffic. Soil resistant to soil probe entry at one or more depths within plow depth.	Infiltration capacity lowered and surface runoff increased due to reduced plant cover. Soil probe enters soil easily. Scattered signs of livestock trails and hoof prints with impact confined to lanes or small wet areas.	Infiltration capacity and surface runoff are similar to that expected for an ungrazed meadow or pasture not impacted by livestock traffic.	3	0.5	1.5
Erosion (Including irrigation induced) / **15%**	Large bare areas with active sheet & rill erosional features represent more than 20% of pasture. Enlarged (deepened or widened) corrugates or center pivot wheel tracks; >50% of corrugate lengths are eroded; sediment deposition evident within the pasture; irrigation tailwater/runoff with visible sediment load.	Bare areas with active sheet & rill erosion less than 20% of pasture. >50% of corrugate lengths are eroded; active erosion at turnouts from water conveyances, near sprinkler heads; or center pivot wheel tracks; irrigation tailwater has visible sediment load; large-sized debris off the pasture accumulates at bottom of field.	Active sheet & rill erosion represents no more than 5% of pasture with most erosion limited to sites adjacent to irrigation system components (i.e., turnouts, sprinkler heads, center pivot tracks); <50% of corrugate lengths are eroded; irrigation tailwater or runoff with little visible sediment load; some plant litter collects at bottom of field.	No visible evidence of active erosion; some evidence of past erosion but features are blunted and now vegetated; debris dams formed by litter, if present, are random and scattered over pasture area.	No evidence of past or current erosion due to irrigation within pasture.	3	1.5	4.5

Overall Pasture Condition Score	**Individual Indicator Score**	**Management Change Suggested**	**Overall Pasture Condition Score =**	0.0
45 to 50	5	No changes in management needed at this time.		
35 to 45	4	Minor changes would enhance, do most beneficial first.		
25 to 35	(3)	Improvements would benefit productivity and/or environment.		
15 to 25	2	Needs immediate management changes, high return likely		

26.7

Flint Creek riparian restoration 014-2020

Pasture Condition Score sheet - Standard for IRRIGATED PASTURE

MT-ECS-116A

Cooperator	Flint Creek	**Date**	10-10-17
Conservationist	BW		
Forage Suitability Group(s)	Garrison foxtail, timothy, K blue grass, sedge	**Pasture number(s)**	1,2,3,5,6,7,8,13,14 (Sub-irrigated)
Current Years Precipitation (check one)	Above Normal ☑ Normal ☒	Below Normal ☒	

Evaluate the site and rate each indicator based upon your observations. Scores for each indicator may range from 1 to 5. Multiply the points x the weight to get weighted points. Sum the weighted points to determine

Indicator/Weight	1 Points	2 Point	3 Points	4 Point	5 Points		Wt.	Wtd. Pts.
Percent Desirable Plants / 10%	Desirable forage species represent <30% of stand (total ADW). Annual weeds, other undesirable herbaceous plants, and/or woody species, dominate pasture.	Desirable forage species represent 30 to 50% of stand (total ADW). Broadleaf weeds and other undesirable herbaceous species are prevalent and expanding. Woody species often present.	Desirable forage species represent 51 to 75% of stand (total ADW). Undesirable broadleaf weeds and annual grasses present and expanding. Some woody species may be present.	Desirable forage species represent 76 to 90% of stand (total ADW). Remainder of the stand is composed primarily of perennial forage species with intermediate grazing value. Few undesirable broadleaf weeds or annual grasses present. No woody species	Desirable forage species exceed 90% of pasture stand (total air-dry weight ADW). Remainder of the stand is comprised of perennial forage species having intermediate grazing value.	3	1.0	3
Live Plant Cover (Live stems and green leaf cover of all species at adjusted 3" height.) / **15%**	FOLIAR COVER: <50% BASAL COVER: <15% Photosynthetic area very low. Very little plant cover to slow or stop runoff.	FOLIAR COVER: 51 to 70% BASAL COVER: 15 TO 25% Photosynthetic area low. Low retardation to runoff by pasture vegetation.	FOLIAR COVER: 71 to 90% BASAL COVER: 25 TO 35% Most forage plants grazed close; little leaf area to intercept sunlight. Moderate retardation to runoff by pasture vegetation.	FOLIAR COVER: 91 to 95% BASAL COVER: 35 TO 50% Pasture not uniformly grazed and there is some loss of potential for photosynthetic activity. pasture vegetation offers high retardation to runoff.	FOLIAR COVER: 96 to >100% BASAL COVER: >50% Forages maintained in leafy condition for best photosynthetic activity. Very dense stand with either no runoff, or very slow runoff flows.	3	1.5	4.5
Plant Diversity (Evaluate as a complete system. Functional groups of forages are plant groupings that have similar growth habits and management needs). / **10%**	One dominant perennial forage species (>75% of stand for total ADW). or, More than 5 forage species (each <20% of stand) all of one functional group. Uneven grazing use. Grazing use poorly distributed.	Two to five forage species all of one functional group (>75% of stand for total ADW). At least one perennial forage species avoided by livestock resulting in presence of mature seed stalks and uneven grazing use. Forage species occur in patches, and are not intermixed.	Two to three forage species all of one functional group (each at least 20% of stand for total ADW). Forage species intermixed, have compatible growth habits, similar re-growth periods, and have comparable palatability. No forage plants ungrazed.	Two to four forage species representing two functional groups (each at least 20% of stand for total ADW) – at least one perennial grass and one perennial legume species are present. Forage species well intermixed, have compatible growth habits, similar re-growth periods, and comparable palatability. No forage plants ungrazed	Three to five forage species representing at least three functional groups (each ±20% of stand for total ADW) – at least one grass and one legume species are present. Forage species well intermixed, have compatible growth habits, similar re-growth periods, and have comparable palatability. No forage plants ungrazed.	3	1.0	3
Plant residue (organic material covering soil between tillers or stems) / **3%**	Ground Cover: No identifiable residue present on soil surface. Thatch, if present, is heavy (>1-inch thick). STANDING-DEAD FORAGE: More than 25% of total pasture production (air-dry weight).	Ground Cover: <10% of soil surface with dead forage plant residue present. Thatch, if present, 0.5" to 1" thick. STANDING-DEAD FORAGE: 5 to 25% of total pasture production (air-dry weight).	Ground Cover: 10 to 20% of soil surface with dead forage plant residue present. Thatch buildup, if present, less than 0.50" thick. STANDING-DEAD FORAGE: 5 to 15% of total pasture production (air-dry weight).	Ground Cover: 20 to 30% of soil surface with dead forage plant residue present. No thatch buildup. STANDING-DEAD FORAGE: Less than 5% of total pasture production (air-dry weight).	Ground Cover: 30 to 70% of soil surface covered with dead forage plant residue. No thatch buildup. STANDING-DEAD FORAGE: No standing dead forage plant material available to grazing animals.	3	0.3	.9
Plant Vigor / 20%	No recovery after grazing; or leaves pale yellow to brown; or plants at permanent wilting point; or most all plants evidence stress due to insects and/or disease. Exercise paddock only. Or, lodged, dark green, overly lush, forage that is generally avoided.	Recovery after grazing takes 2 or more weeks longer than normal; or yellowish-green leaves; or major insect or disease loss; or plants wilted most of day. Productivity 50 to <70% of the high production potential for the site.	Recovery after grazing takes 1 week longer than normal; or urine or dung patches dark green in contrast to rest of plants; or minor insect or disease loss; or plants wilted only during mid-day. Pasture productivity 70 to 85% of the high production potential listed for the site.	Recovery after grazing takes 1 or 2 days longer than normal; or light-green leaves of most plants as contrasted to greener plants in urine and dung patches; or minor insect or disease damage. No plant wilting. Productivity of stand near the high production potential listed for the site.	Rapid recovery following grazing. Healthy green color of foliage. No sign of insect or disease damage. No leaf wilting. Yields at listed high production potential for species adapted to the site.	3	2.0	6

014-2020

Flint Creek riparian restoration

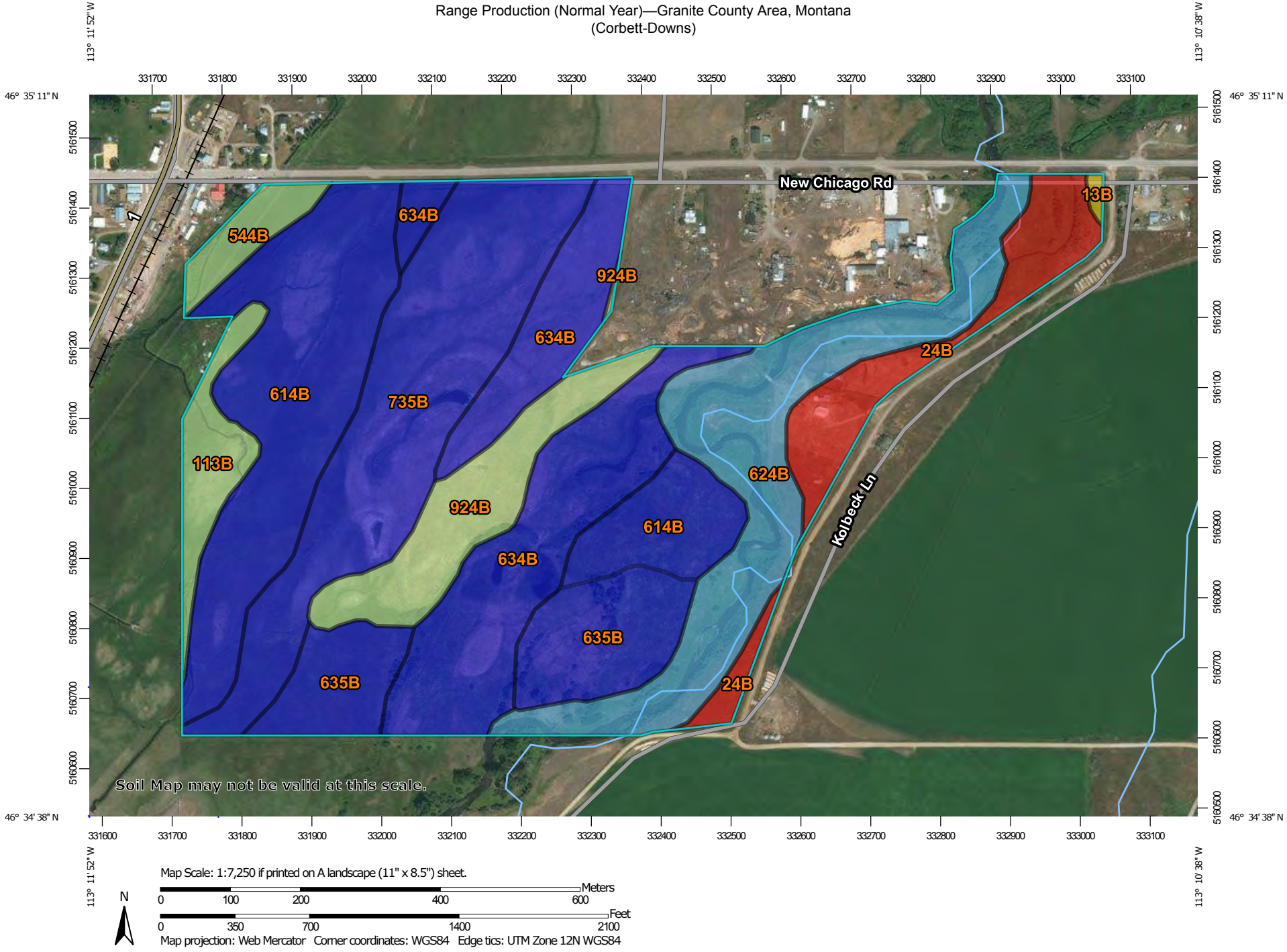
Evaluate the site and rate each indicator based upon your observations. Scores for each indicator may range from 1 to 5. Multiply the points x the weight to get weighted points. Sum the weighted points to determine

Indicator/Weight	1 Points	2 Point	3 Points	4 Point	5 Points		Wt.	Wtd. Pts.
Percent legume (Cool season stands) / **5%**	No legume in pasture; or, more than 60% (total ADW) of bloat-causing legumes.	Non-spreading forage legumes less than 15% (ADW); or, 45% to 60% (total ADW) of spreading legume with grass composition declining.	Non-spreading forage legumes represent 15% to <25% (total ADW) of pasture production. Spreading legumes may be increasing.	Non-spreading forage legumes represent 25% to <35% (total ADW) of pasture production.	Non-spreading forage legumes represent 35% to 45% (total ADW) of pasture production. No forage grass loss; forage grasses may be increasing. Non-spreading legumes would include alfalfa, birdsfoot trefoil, sainfoin, cicer milkvetch. Spreading legumes would include clovers and black medic.	1	0.5	.5
Uniformity of Use / 7%	Little-grazed patches cover over 50% of pasture. Mosaic pattern of grazing use; or there are identifiable areas within pasture being avoided.	Little-grazed patches cover over 25 to 50% of pasture either in a mosaic pattern or as identifiable areas within the pasture that are not frequented.	Little-grazed patches cover 10 to 25% of pasture either in a mosaic pattern or as identifiable areas within pasture that are not frequented.	Little-grazed patches represent minor spots where one to several forage plants are not grazed. Urine and dung patches are avoided.	Ungrazed areas only at urine or dung patches. No ungrazed forage species.	4	0.7	2.8
Livestock Concentration Areas / 10%	Livestock concentration areas and trails cover >10% of the pasture; or all concentration areas allow for contaminated runoff to be conveyed directly into adjacent water bodies.	Livestock concentration areas and trails cover 5 to 10% of the pasture; most concentration areas are close to water channels allowing contaminated (unbuffered) runoff to drain into adjacent water bodies.	Isolated livestock concentration areas and trailing evident (<5% of pasture); no more than one concentration area that drains (unbuffered) directly into adjacent water body.	Some livestock trailing evident with one or two, small, concentration areas. There is a buffer zone between any concentration area and adjacent water bodies.	Absence of livestock concentration areas and trailing; Or, heavy use areas located or treated to minimize contaminated runoff.	3	1.0	3
Soil Compaction (Probe moist soil comparing the treatment unit to an ungrazed area; i.e. fence row.) / **5%**	Infiltration capacity and surface runoff severely affected by compaction. Livestock traffic is eradicating pasture plants over large areas. Very hard to push a probe into soil without damage to probe.	Infiltration capacity reduced due to large areas of bare ground and dense compaction layer at surface. Livestock trails common. Off-trail hoof prints common. Hard to push a probe through soil layers.	Infiltration capacity lowered and surface runoff increased due to plant cover loss and soil compaction by livestock traffic. Soil resistant to soil probe entry at one or more depths within plow depth.	Infiltration capacity lowered and surface runoff increased due to reduced plant cover. Soil probe enters soil easily. Scattered signs of livestock trails and hoof prints with impact confined to lanes or small wet areas.	Infiltration capacity and surface runoff are similar to that expected for an ungrazed meadow or pasture not impacted by livestock traffic.	4	0.5	2
Erosion (Including irrigation induced) / **15%**	Large bare areas with active sheet & rill erosional features represent more than 20% of pasture. Enlarged (deepened or widened) corrugates or center pivot wheel tracks; >50% of corrugate lengths are eroded; sediment deposition evident within the pasture; irrigation tailwater/runoff with visible sediment load.	Bare areas with active sheet & rill erosion less than 20% of pasture. >50% of corrugate lengths are eroded; active erosion at turnouts from water conveyances, near sprinkler heads; or center pivot wheel tracks; irrigation tailwater has visible sediment load; large-sized debris off the pasture accumulates at bottom of field.	Active sheet & rill erosion represents no more than 5% of pasture with most erosion limited to sites adjacent to irrigation system components (i.e., turnouts, sprinkler heads, center pivot tracks); <50% of corrugate lengths are eroded; irrigation tailwater or runoff with little visible sediment load; some plant litter collects at bottom of field. *Stream bank erosion	No visible evidence of active erosion; some evidence of past erosion but features are blunted and now vegetated; debris dams formed by litter, if present, are random and scattered over pasture area.	No evidence of past or current erosion due to irrigation within pasture.	3	1.5	4.5

Overall Pasture Condition Score	Individual Indicator Score	Management Change Suggested		
45 to 50	5	No changes in management needed at this time.	Overall Pasture Condition Score =	0.0
35 to 45	4	Minor changes would enhance, do most beneficial first.		
25 to 35	(3)	Improvements would benefit productivity and/or environment.		
15 to 25	2	Needs immediate management changes, high return likely.		

30.2

Range Production (Normal Year)—Granite County Area, Montana
(Corbett-Downs)



Range Production (Normal Year)—Granite County Area, Montana
(Corbett-Downs)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- <= 1185
- > 1185 and <= 1872
- > 1872 and <= 2125
- > 2125 and <= 3010
- > 3010 and <= 3455
- Not rated or not available

Soil Rating Lines
- <= 1185
- > 1185 and <= 1872
- > 1872 and <= 2125
- > 2125 and <= 3010
- > 3010 and <= 3455
- Not rated or not available

Soil Rating Points
- <= 1185
- > 1185 and <= 1872
- > 1872 and <= 2125
- > 2125 and <= 3010
- > 3010 and <= 3455
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Granite County Area, Montana
Survey Area Data: Version 17, Sep 21, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 30, 2015—Sep 27, 2016

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Range Production (Normal Year)

Map unit symbol	Map unit name	Rating (pounds per acre per year)	Acres in AOI	Percent of AOI
13B	Windlass-Nirling complex, 0 to 4 percent slopes	1872	0.3	0.2%
24B	Conn loam, 0 to 4 percent slopes	1185	11.6	6.9%
113B	Windlass-Nirling complex, 0 to 4 percent slopes, rarely flooded	2085	5.6	3.3%
544B	Gregson silt loam, 0 to 4 percent slopes	2125	3.4	2.0%
614B	Bandy loam, 0 to 4 percent slopes	3450	34.1	20.3%
624B	Nirling-Bandy complex, 0 to 4 percent slopes, rarely flooded	3010	26.0	15.4%
634B	Blossberg loam, 0 to 4 percent slopes	3425	30.2	17.9%
635B	Tetonview loam, 0 to 4 percent slopes	3455	15.6	9.3%
735B	Nythar-Flintcreek complex, 0 to 4 percent slopes	3455	29.8	17.7%
924B	Nirling cobbly loam, 0 to 4 percent slopes	2029	11.6	6.9%
Totals for Area of Interest			**168.2**	**100.0%**

Description

Total range production is the amount of vegetation that can be expected to grow annually in a well managed area that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation. In a normal year, growing conditions are about average. Yields are adjusted to a common percent of air-dry moisture content.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Rating Options

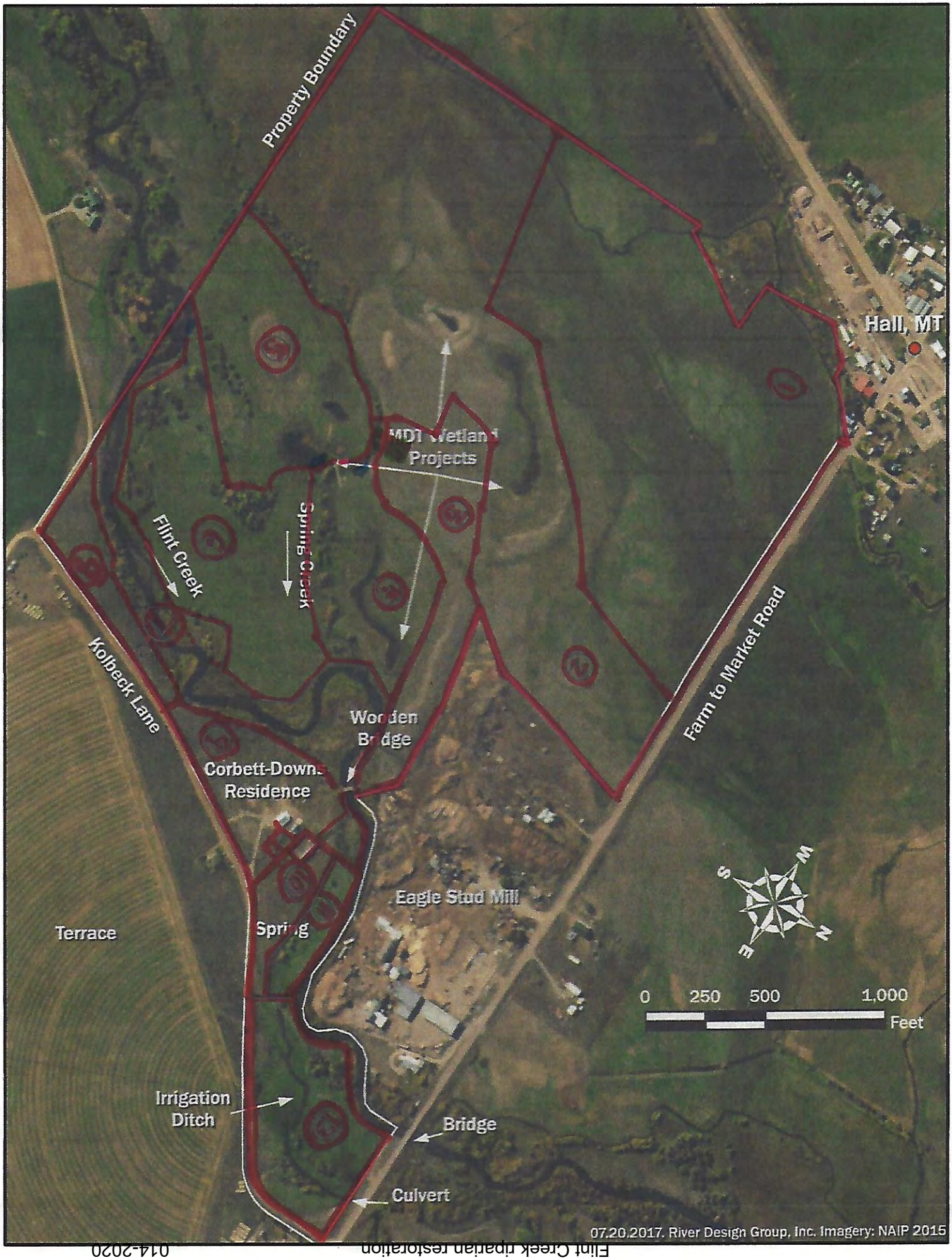
Units of Measure: pounds per acre per year

Aggregation Method: Weighted Average

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Interpret Nulls as Zero: Yes



Flint Creek riparian restoration

014-2020